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Sunesen, Eva Rytter

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by

Eva Rytter Sunesen

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Department of Economics
University of Copenhagen
Øster Farimagsgade 5, building 26
DK-1353 Copenhagen K.
www.econ.ku.dk

PhD Thesis

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By

Eva Rytter Sunesen
Department of Economics
University of Copenhagen

Advisors: Carl Johan Dalgaard and Heino Bohn Nielsen
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Contents

Preface

This collection of four essays constitutes my Ph.D. thesis on "Understanding the Distribution of Foreign Direct Investment in Developing Countries". The research for this thesis was carried out while I was a Ph.D. student at Copenhagen University.

I would like to take this opportunity to thank colleagues, friends and family for their invaluable support and encouragement throughout the project. I am particularly indebted to my supervisors, Carl Johan Dalgaard and Heino Bohn Nielsen, for their inspiration, engagement and enthusiasm throughout the process. Their critical questions and firm guidance when I was off track have speeded up the working process and enabled me to keep important deadlines. I have appreciated the straightforward and humorous tone in our discussions and their readiness to read through my papers whenever I needed their feedback.

Special thanks go to my colleagues in the Development and Economic Research Group (DERG) for contributing to an inspiring and stimulating research environment. It was always enjoyable to debate the most recent political events and to get the latest faculty gossip at the Wednesday breakfasts. And, in particular, I acknowledge Finn Tarp for devoting so much time and effort to raise the funds that make it all possible.

A thought also goes to my co-author Pablo Selaya - it has been a constructive and pleasant experience to work with you. I have also appreciated the company of my "roomies" Pablo Selaya and Christoffer Sonne-Schmidt with whom I have had many useful discussions about econometric issues, STATA programming and life in general.

Finally, and most importantly, I am indebted to my husband, Morten Rytter Sunesen, for his unconditional and invaluable encouragement throughout the project. Being with you and our three wonderful daughters always made me stay on track and helped me stand by my values and priorities.

I hope you enjoy the reading.

Eva Rytter Sunesen
Copenhagen, February 2009

Summary

Foreign direct investment (FDI) has become an increasingly important source of capital in developing countries during the last decade with FDI inflows more than tripling since the mid 1990s. Due to its potential to transfer knowledge and technology, create jobs, boost overall productivity, and enhance competitiveness and entrepreneurship, attracting FDI to developing countries is essential to contribute to economic growth, development and poverty reduction. For these reasons, it is important for policy makers in these countries to understand the driving forces of FDI.

So far, researchers have been unable to reach a consensus on a theoretical framework to guide empirical work on FDI, which has resulted in an enormous volume of empirical papers that vary in their selection of explanatory variables, in their econometric methodology and in their theoretical foundation. The four papers contained in this thesis contribute to the literature on FDI in several ways.

The first paper provides a systematic review of empirical studies in order to detect regularities in the regional distribution of FDI among developing countries. The second paper attempts to solve the ambiguity in the choice of political, economic and commercial risk variables by deriving a deep-rooted and structural idiosyncratic risk measure. The third paper argues that global and regional business cycle effects should be accounted for in the empirical FDI specification, and it proposes to use a portfolio approach to explain the distribution of FDI across developing countries. Finally, the fourth paper emphasises the importance of complementary factors in a country's attractiveness for foreign investors and concludes that foreign aid should be directed towards such factors in order to have a dynamic effect on FDI.

The papers included in this thesis build on a broad selection of micro-econometric tools (cross-section and panel data estimation techniques). Each chapter is self-contained but Chapter 3 applies the risk measure derived in Chapter 2. Also, the review in Chapter 1 provides a base of knowledge that benefits the remaining chapters. A summary of each chapter is given below.

Chapter 1 *Examining the Regional Aspect of Foreign Direct Investment to Developing Countries* sets out to detect regularities in the regional distribution of FDI by reviewing the part of the literature that in some way or the other tackles the regional aspect of FDI. Furthermore, the results from a general-to-specific analysis suggest that regional differences in FDI inflows to African, Asian and Latin American countries can be explained by structural characteristics rather than fixed regional effects. The implication is that countries that are lagging behind other developing countries in attracting foreign capital have the opportunity to implement policies aimed at improving the investment climate for foreign investors and thereby increase FDI inflows. This also means that there is no African bias.

Furthermore, we find that growth and inflation are robust and significant across regions although the size of their impact varies, while other variables clearly turn out to be region-specific. While African and Asian countries are largely heterogeneous both with respect to the set of explanatory variables and their impact on FDI, Asian and Latin American countries are more homogeneous and can more readily be pooled as long as proper interaction terms are specified.

Chapter 2 *Measuring Idiosyncratic Risk: Implications for Capital Flows* offers a refined risk measure that is based on the variance of GDP growth. Since the variance of GDP growth can only be interpreted as idiosyncratic country risk when events are unpredictable, this paper offers a refinement that serves to take out the structural and systematic components and ends up with an improved proxy for idiosyncratic risk. The chapter proceeds in two steps. First, we derive a conditional risk measure by drawing on the augmented Solow growth model to account for structural characteristics of the host country that move only slowly and therefore can be partly predicted by the investor. Second, since countries are interdependent there will be some systematic components in the local return to investment that depend on common factors, and we use a principal components analysis to adjust for the systematic risk caused by synchronisations in global and regional business cycles.

The decomposition of risk into its systematic and idiosyncratic components reveals that not only are African countries on average characterised by a larger conditional risk than Asian and Latin American countries, but the idiosyncratic risk factor also represents a larger share than in other developing countries. As a final exercise we use a general-to-specific methodology and find that both economic and political risk variables are important determinants of idiosyncratic risk whereas the commercial aspects of risk are poorly defined. Rather than including various risk measures on an ad hoc basis, our results indicate that the ability of a country to service its debt, the current account balance, government consumption, democratic accountability and external conflicts are important determinants of risk.

Chapter 3 *A Mean-Variance Explanation of FDI Flows to Developing Countries* is based on the observation that an important feature of the world economy is the close global and regional integration due to strong trade and investment relations among countries. The high degree of integration between countries is likely to give rise to business cycle synchronisation in which case shocks spill over from one country to another thus giving rise to systematic movements in returns that can be partly predicted by an investor. This chapter utilises a simple mean-variance optimisation framework where global and regional factors capture the interdependence between countries. The model implies that FDI is driven by the risk-adjusted rate of return as well as global and regional spillovers.

We test the implications of the theoretical model in a cross-section of 60 developing countries. We find that the strong relationship between FDI inflows and the risk adjusted

rate of return can only be observed when a precise measure of idiosyncratic risk is applied; that is once we control for systematic movements due to both global and regional business cycle synchronisation. We also find that there is a relatively large and positive net effect from global integration. On the regional level, there is a positive net effect of being located in Asia and (to a lesser extent) in Africa.

Chapter 4 *Does Aid Increase Foreign Direct Investment?* analyses the notion that Official Development Assistance (ODA) and FDI are complementary sources of capital, i.e. that ODA has a "catalysing" effect on FDI. We set up an open-economy Solow model with perfect capital mobility that distinguishes between aid directed towards complementary factors of production and aid invested in physical capital. The distinction serves to illustrate, on the one hand, that aid invested in complementary factors increases MPK in the recipient country, which tends to draw in additional foreign resources, and thus helps to sustain a higher level of capital over time. On the other hand, the model also shows that increased foreign aid invested in physical capital competes with other types of capital, and thus replaces investments that private actors would have undertaken anyway. In this case, capital mobility and rate-of-return equalisation across countries mean that aid inflows will only give rise to a flight of other types of capital.

The chapter takes the implications of the theoretical model to the data utilising a panel of 84 countries over the period 1970-2001. The results strongly support the hypotheses that aid invested in complementary inputs draws in foreign capital while aid invested in physical capital crowds out FDI. The combined effect of these two types of aid is small but on average positive, which implies that more aid should be directed towards inputs complementary to physical capital in order to optimise the return on aid.

Chapter 1
Understanding the Regional Aspect of FDI

Examining the Regional Aspect of Foreign Direct Investment to Developing Countries*

Eva Rytter Sunesen†
Department of Economics, University of Copenhagen

Abstract

This paper applies a general-to-specific analysis to detect regularities in the driving forces of foreign direct investment (FDI) that can explain why some regions are more attractive to foreign investors than others. The results suggest that regional differences in FDI inflows to African, Asian and Latin American countries can be fully explained by structural characteristics rather than fixed regional effects. The implication of this finding is that countries that are lagging behind other developing countries in attracting foreign capital have the opportunity to implement policies aimed at improving the investment climate for foreign investors. This also means that there is no African bias. Among a large number of return and risk variables applied in the empirical literature, growth and inflation turn out to be the only robust and significant FDI determinants across regions although the size of their impact varies.

Keywords: Foreign direct investment, Africa, Asia, Latin America, general-to-specific

JEL classifications: F21, O57

1 Introduction

During the last two decades, most developing countries have reformed their institutions, improved their infrastructure and liberalised their regulatory framework in order to attract foreign direct investments (FDI). However, Table 1 shows that FDI inflows in absolute terms remain unevenly distributed among developing countries and regions. Asia proved to be the biggest destination of FDI accounting for more than half of total FDI going to developing countries, followed by Latin America that absorbed close to one third. In Asia,

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†Department of Economics, University of Copenhagen. Studiestræde 6, 1455 Copenhagen K, Denmark. E-mail address: eva.rytter.sunesen@econ.ku.dk.

the main part of FDI flows to East Asia, where China is the most favoured FDI destination receiving more than 20 per cent of FDI going to developing countries.[1] Africa, on the other hand, received a small and declining share of FDI. If we adjust for the economic size of the country and analyse FDI as a share of GDP, Figure 1 shows a more even distribution of FDI although regional differences persist. While East Asia took off in the 1990s, recently Africa has managed to attract further FDI inflows. Relative to its economic size, FDI to Africa is now at comparable levels with East Asia and Latin America. South Asia continues to be lagging behind. This paper sets out to analyse regional differences in FDI between African, Asian and Latin American countries.[2]

First, it reviews the subset of FDI studies that have tackled the regional aspect of the FDI decision by including regional dummies, by including interactions between regional dummies and selected explanatory variables or by analysing FDI flows on a regional basis. While the broad FDI literature has been reviewed quite frequently, this paper is the first to focus on the regional aspect of FDI and to collect regional studies in a coherent framework. This approach provides information about regularities in the driving forces of FDI across regions and points out possible region-specific variables. The findings suggest that regional dummies rarely turn out significant in elaborate models of FDI, that the significance of interactions between regional dummies and FDI determinants suggests that there is a large degree of heterogeneity between regions and, finally, that there seems to be a pool of common FDI determinants but that region-specific characteristics should also be taken into account.

Since the empirical studies reviewed in this paper vary widely in their sample selection, estimation method, time horizon and set of explanatory variables the results are not directly comparable, and it is therefore difficult to draw conclusions about why we observe differences in the regional distribution of FDI. Since there is no consensus of a theoretical framework for FDI, we let the data speak.

In the second part of the paper we apply a general-to specific analysis of the many FDI determinants that have been applied in the existing literature. We do so both in a broad cross-section of developing countries, where we also include regional dummy variables, and on a region-by-region basis. Overall, the results suggest that regional differences are not due to fixed regional effects. We find that growth and inflation are robust and significant across regions although the size of their impact varies, while other variables clearly turn out to be region-specific. While African and Asian countries are largely heterogeneous both with respect to the set of explanatory variables and their impact on FDI, Asian and

[1] In light of China's outstanding role, some studies exclude China from the sample (see UNCTAD (1994) and World Bank (1996) for further discussion). As an alternative, Jakobsen and Soysa (2006) include a China dummy that turn out positive and highly significant.

[2] A large number of studies analyse the flow of FDI to Eastern European countries. These studies are typically based on a gravity model specification of bilateral FDI flows and will not be reviewed here. Also, studies of FDI to the Middle East and North African countries are too scarce to draw meaningful comparisons.

Latin American countries are more homogeneous and can more readily be pooled as long as proper interaction terms are specified.

The paper proceeds as follows. Section 2 gives a short introduction to the ways regional differences have been modelled econometrically in the empirical FDI literature. Section 3 reviews the subset of empirical FDI studies that have set out to explain regional differences in FDI by including regional dummies, by including interactions between regional dummies and selected explanatory variables to control for heterogeneity, or undertaking regional studies that assume complete heterogeneity between regions and furthermore allow for the inclusion of region-specific variables. Section 4 applies a general-to-specific analysis of 36 potential FDI determinants in 100 developing countries on an overall as well as on a regional basis. Finally, Section 5 summarises and concludes.

2 Modelling the Regional Aspect of FDI

The regional aspect of FDI has been approached in many different ways in the empirical FDI literature. At one extreme, it has been argued that foreign investors think of countries as being completely independent and homogeneous so that FDI flows can be explained by the same set of explanatory variables and homogeneous parameters independent of the countries included in the sample:

$$FDI_{it} = \alpha + x_{it}^{'}\beta + u_{it}, \tag{1}$$

where FDI_{it} is the inflow of FDI to country i $(i = 1, ..., N)$ as a share of GDP, N is the number of developing countries in the sample at time t $(t = 1, ..., T)$, x_{it} is a vector of FDI determinants and u_{it} is an error term. In this case, regional differences in the inflow of foreign capital can be fully explained by different country characteristics captured by x_{it}. The broad FDI literature based on (1) has been reviewed quite frequently but so far no consensus about the theoretical model or the econometric specification of the FDI relation has been reached (see Bloningen (2005) for a recent survey).

The inability of (1) to explain the distribution of FDI across countries and regions has lead some researchers to look for new explanatory variables to be included in x_{it} (most notable is the recent inclusion of various risk variables), while others have tested alternative ways to model FDI. This paper focuses on the latter approach and reviews empirical FDI studies that allow for regional heterogeneity.

The first group of studies bases the analysis on a panel of countries belonging to different regions. In general, this group of studies base their empirical FDI specification on a variant of:

$$FDI_{ijt} = \alpha_j + x_{ijt}^{'}\beta_j + u_{ijt}, \tag{2}$$

where α_j is a regional dummy variable that takes on the value one for countries belonging to region j and zero otherwise ($j = 1, ..., J$ where J is the number of regions) and which adjusts for time invariant regional effects. In this case, x_{ijt} is a vector of explanatory variables that possibly includes interactions between regional dummies and selected explanatory variables.

The panel studies with regional dummies (reviewed in Section 3.1) explain regional differences in FDI inflows by time-invariant regional effects. If one believes that FDI flows are ultimately driven by arbitrage that leads to the equalisation of marginal productivity of production factors, see Selaya and Sunesen (2008), then this approach argues that the uneven distribution of FDI is due to some regional effect that allows the productivity of production factors in one region to differ systematically from other regions. We could think of this as "historic agglomeration effects" that have given the region a reputation or as permanent differences in production factors. If such time-invariant regional effects turn out to be important, the implication is that a country that is lagging behind today will stay behind irrespective of its ability to implement policies aimed at strengthening the institutions that are positively associated with FDI (included in x_{ijt}).

The panel studies with heterogeneous effects (reviewed in Section 3.2) use interactions between regional dummies and selected explanatory variables to allow for heterogeneity in the response to FDI determinants. One reason for such structural differences is that investors are attracted to different countries according to their motive for investing abroad.[3] If the composition of FDI in this way varies systematically across regions, it is likely that the flow of FDI to these regions will respond differently to traditional FDI determinants. Empirically, this means that the vector of explanatory variables should include interactions between the regional dummy variable and the explanatory variables thereby allowing parameter estimates to vary across regions.

The second group of studies (reviewed in Section 3.3) bases the analysis on a panel of countries that belong to the same region and estimates (1) for the region under review. This estimation method therefore allows for full heterogeneity in both α_i and β_i between regions. One reason for using this approach is that some studies aim at answering questions, which require the use of region-specific variables that might not be relevant or might not even exist for other regions. Examining the impact of transition on FDI inflows to Eastern European countries could be one example.

In the next section we review the large number of empirical studies that have modelled the regional aspect of FDI explicitly. We do so in order to detect empirical regularities in the driving forces of FDI that can inform us about the degree of heterogeneity across regions. Ultimately, this should lead to a greater understanding of what causes regional differences in the distribution of FDI.

[3] The literature typically distinguishes between market-seeking, resource-seeking, efficiency-seeking and asset-seeking FDI.

3 Review of Empirical FDI Studies

This section provides a comprehensive and structured review of empirical studies of FDI to African, Asian and Latin American countries that have taken the regional distribution of FDI into account by including regional dummy variables, by incorporating interactions between regional dummy variables and potential FDI determinants or by analysing FDI on a regional basis. These papers are typically based on panel data estimation methods where the dependent variable is FDI as a share of GDP but where the number of countries, the time dimension and the selection of explanatory variables differ widely.

3.1 Panel Studies with Regional Dummies

Table 2 summarises the findings of 10 studies that are based on (2) in that they include regional dummy variables. In general, the regional dummy variables should be interpreted relative to other developing countries. A significant African dummy thus suggests that Africa is different from other developing countries. As one exception, the regional dummies in Addison and Heshmati should be interpreted relative to developed countries. Overall, we find that only 10 out of the 17 dummy variables included in the 10 studies under review report dummy variables that are significant and robust to the inclusion of an extended set of explanatory variables.

More than half of the studies included in this review have analysed if there is a particular effect of being located in **Africa**. Jaspersen et al. (2000) and Asiedu (2002) find that African countries receive 2% and 1.3% points, respectively, less FDI than a comparable country outside the region. The African dummy in Addison and Heshmati (2003), Noorbakhsh and Youssef (2001), Ancharaz (2002) and Wilhelms and Witter (1998), on the other hand, turned out insignificant once economic, political and structural characteristics were taken into account.

The negative **South Asian** regional dummy found in Addison and Heshmati (2003) remains after controlling for traditional FDI determinants as well as the democratic situation in these countries. However, the significant South Asian effect in Gani (2007) disappears once governance indicators (rule of law, control of corruption and regulatory quality) are adjusted for. While a number of studies have found a positive and significant **East Asian** dummy only in the case of Addison and Heshmati (2003) did it turn out to be robust to an extended set of explanatory variables. The **Latin American** dummy in Noorbakhsh and Youssef (2001), Edwards (1990) and Hein (1992) was not robust to the inclusion of other control variables, while the results in Addison and Heshmati (2003) suggest that Latin American countries receive 1.2% points more FDI than comparable countries.

3.2 Panel Studies with Heterogeneous Effects

The six papers reviewed in this section are based on the premise that the relative impact of FDI determinants should be allowed to vary across regions, and the specification therefore includes interactions between FDI determinants and the regional dummy variables like in (2).[4] The results suggest that agglomeration effects, growth and openness are equally important in all regions, whereas the return on investment, infrastructure, political instability and fiscal incentives, among others, have a heterogeneous impact on FDI across regions. We also find that region-specific factors should be taken into account.

A number of studies analyse if countries in one region are different from other developing countries. Asiedu (2002) and Kolstad and Villanger (2008) find that openness has an equal impact on FDI irrespective of regional location. Asiedu (2002) also finds that the provision of infrastructure and the return on investment have a larger impact on FDI to African than non-African countries. The latter result is confirmed by Razafimahefa and Hamori (2005). Kolstad and Villanger (2008) find that FDI to Latin America is particularly sensitive to political instability, while the absence of regulation appears to have been a particularly beneficial factor.

Another set of studies compare determinants of FDI in several regions. Asiedu and Lien (2004) find that the impact of capital controls on FDI varies by region: capital controls have no effect on FDI to African countries but affect FDI to East Asia and Latin America adversely. Chen (1998) finds that agglomeration, growth and government expenditures are equally important in Latin America and South East Asia, whereas fiscal incentives and growth of export have a heterogeneous impact on FDI in the two regions. In his comparison of Asia and Latin America, Nasser (2007) finds a great degree of heterogeneity between the two regions. While agglomeration effects are equally important in the two regions, infrastructure (telephone lines) and political instability (revolutions and assassinations) have significant but different effects in the two regions. A large number of factors (GDP, inflation, current account, schooling and political rights) only turn out significant in one of the regions.

3.3 Regional Studies

Table 3 and Table 4 review 21 regional studies of FDI that base their FDI specification on (1) for the group of either African, Asian or Latin American countries.[5] To ease interpretation and comparison, the FDI determinants have been divided into return (market

[4] Chen (1998) also uses dummy variables to compare FDI in Latin American and South East Asian countries. However, this paper is excluded since the dependent variable is FDI in per capita terms which invalidates comparisons with the other papers in the review.

[5] Kandiero and Chitiga (2003), Quazi (2007b), Chen (1998), Trevino et al. (2002a, 2002b), Vogiatzouglou (2007) and Trevino and Mixon (2004) are excluded from the review since they use absolute FDI or FDI in per capita terms as their dependent variable.

potential, factor market characteristics, domestic market access, international openness and geography) and (economic, political and commercial) risk. The overall picture arising from these studies is very much in line with the findings in Section 3.2. While growth, agglomeration and inflation are important in all regions, the impact of other FDI determinants turns out to vary with regional location. Natural resource availability, infrastructure and financial stability are important in Africa; labour costs and fiscal incentives in Asia; and fiscal balance, exchange rate stability, financial stability and political instability in Latin America.

Of the **return** variables listed in Table 3, the market potential proxies are the most frequently used. The preferred variables are GDP, population size, GDP per capita and GDP growth, which most often have a significant and positive effect on FDI.[6] The results also show strong agglomeration effects. The regions differ widely in their dependence on various factors of production. While labour costs and labour availability are relatively important in Asia, the relatively poor quality of the labour force has been an important deterrent factor for FDI to African and Latin American countries. Also, natural resource availability has been a driving force in Africa. Infrastructure turns out to be important in most regions but most often so in Africa where landlocked and geographically isolated countries face big problems in attracting foreign capital. Advancements in structural reforms and privatisation have been important for the relative attractiveness of countries in Latin America. Finally, trade openness (the most frequently used being total trade) appears to be important in all regions except Asia.

From Table 4 it is clear that the **risk** of investing abroad has only received attention recently probably due to the inability of traditional return determinants to explain the regional distribution of FDI. The economic risk variables are the most frequently included risk measures although their impact varies widely across regions. While high inflation has been a deterrent factor in most regions, financial and political instability seems to have scared away investors in African and Latin American countries. Asian countries, on the other hand, appear to have benefited from a stable or even fixed exchange rate regime. Interestingly, commercial risk is rarely accounted for in Asian and Latin American countries. An accommodating investment climate and business environment (in particular rule of law) as well as financial stability, on the other hand, have had a significant impact on FDI in African countries.

[6] A few exceptions include Campos and Kinoshita (2008), Botric and Skuflic (2006), Ancharaz (2002) and Nasser (2007) where GDP, population size or GDP per capita turn out to have a negative impact on FDI. However, these papers also include growth as an explanatory variable in which case an explanation might be that growth turns out to be the most important proxy for market potential whereas additional market size proxies capture something else (for example, the level of development).

4 A General-to-Specific Analysis of FDI Flows

One of the main drawbacks in the FDI literature has been the lack of a coherent and generally accepted theoretical framework to think about FDI and to form the basis for empirical analysis. The theoretical vacuum has resulted in an ad hoc selection of FDI determinants, which complicates direct comparisons across studies. To take an example, all empirical papers have included some measure of market potential where GDP, GDP per capita, population or GDP growth are the most commonly used proxies, and valid theoretical arguments can be put forward for each of them. Which one should we pick? To what extent is it appropriate to pick the same proxy irrespective of regional belonging? And when can we expect one variable to have the same impact on FDI irrespective of regional belonging?

Since potential explanatory variables are highly correlated, it is a challenge to select several or all of them while avoiding multicollinearity in the model. We therefore use a general-to-specific model selection approach, which enables us to "test down" among the large set of explanatory variables. We use the *PcGets* software, which automatically selects an undominated, congruent model where statistically insignificant variables are eliminated and where diagnostic tests check the validity of reductions to ensure a congruent final selection. Equation mis-specification tests include residual autocorrelation, ARCH, heteroscedasticity, functional form mis-specification, and non-normality. The path is terminated when all the variables that remain are significant, or a diagnostic test fails. In some cases insignificant variables are therefore retained. We refer to Hendry (1995, Chapter 9) for further details on this data-based model selection methodology.

Based on the empirical papers reviewed in Tables 3 and 4, we have collected data on 19 return proxies and 14 risk measures to enter the general-to-specific analysis along with regional dummy variables for Africa, Asia and Latin America. Data is calculated as an average over the time period 1980-2004 for a cross-section of 100 developing countries (43 belonging to Africa, 35 located in Asia and 22 Latin American countries).[7] A list of countries can be found in Appendix. Details on the data are given in Table 5.

4.1 Empirical Findings

Table 6 reports the main results. One of the most important findings is that none of the regional variables turn out significant, which suggests that regional differences in FDI inflows can be fully explained by structural characteristics. This means that there is no African bias (see Asiedu, 2002, among others). Also, we see that growth and inflation are the only two variables that turn out significant in all specifications although their marginal

[7] Using averages over 25 years and thus eliminating the time dimension, the cross-sectional approach allows us to look for deep structural determinants of FDI. The disadvantage is that in some circumstances our results will not be directly comparable to the panel studies reviewed in the previous section. For example, it will not be possible to test for agglomeration effects by including a lagged dependent variable.

effects vary across regions. While inflation has been a deterrent factor to FDI inflows to Latin American countries, inflation has had a smaller marginal effect in Asian and African countries. Also, high economic growth rates have been relatively more important for Asian countries than African and Latin American countries.

A number of observations from Section 3 are confirmed by the general-to-specific analysis. International openness (trade) is important in all regions except Asia; the stability of the exchange rate regime is important for Asian and Latin American countries; financial and political stability (external debt, current account balance, corruption and rule of law) are important in Latin American countries; while low wages have been a comparative advantage in Asian countries. The results also indicate that the focus on economic risk in studies of FDI into Asia is misleading since political and commercial risk (political rights as well as voice and accountability) are equally important for this region.

International openness has typically been proxied by total trade as a share of GDP, the import share or the export share. Since trade is a linear combination of imports and exports it is not possible to include all three of them at the same time. Table 7 reports the results when we use the import and export shares instead of total trade as our openness proxy. The results from Table 6 are confirmed and we see that the positive effect of trade was driven by import, which was also the case in Janicki and Wunnava (2004) and Ferris et al. (1997).

Also, we find that some variables are region-specific: GDP per capita, land area, roads, international reserves and government expenditure for Africa; wage earnings, political rights and the Kaufmann voice and accountability index for Asia; and telephone, external debt, corruption and ores export for Latin America. The remaining six variables lie somewhere in between where four variables turn out significant in both Asia and Latin America (urban population, current account, change in the exchange rate, variance of the exchange rate) and two enter both the specification in Africa and Latin America (trade openness and rule of law). This suggests that Africa and Asia do not seem to be well described by the same set of variables and one should exercise caution when pooling the two regions. Latin American and Asian countries can more readily be pooled but interaction terms should still be incorporated to adjust for heterogeneity in the impact of common explanatory variables.

5 Summary and Conclusion

This paper provides a comprehensive and structured review of the part of the empirical literature that has analysed the regional differences in FDI inflows. A number of observations are worth highlighting. First, regional dummy variables rarely turn out to be robust once structural characteristics of the host country are properly accounted for. Second, the large number of significant interaction terms between regional dummies and selected

explanatory variables suggests that regions are highly heterogeneous and that investors perceive regions differently. And, third, regional studies suggest that there is a pool of common FDI determinants whose impact varies across regions but also that region-specific characteristics should be taken into account.

Since the empirical studies reviewed in this paper vary widely in their sample selection, estimation method, time horizon and set of explanatory variables the results are not directly comparable. We therefore let the data speak and apply a general-to specific analysis of the many determinants that have been applied in the existing FDI literature. The results suggest that regional differences are not due to fixed regional effects. We find that growth and inflation are robust and significant across regions although the size of their impact varies. The impact from inflation seems stronger in Latin America than in Asian and African countries. Also, economic growth has had a larger marginal effect in Asian countries than in African and Latin American countries. While African and Asian countries turn out to be largely heterogeneous both with respect to the set of explanatory variables and their impact on FDI, Asian and Latin American countries can more readily be pooled as long as proper interaction terms are specified. Finally, some variables appear to be region-specific: GDP per capita, land area, roads, international reserves and government expenditure for Africa; wage earnings, political rights and the Kaufmann voice and accountability index for Asia; and telephone, external debt, corruption and ores export for Latin America.

The findings in this paper suggest that foreign investors respond quite differently to common determinants of FDI across regions and also that region-specific variables are important to take into account when analysing FDI in a broad sample of developing countries. However, this paper does not offer an explanation as to why this is so. One interesting topic for future work could, for example, be to analyse FDI on a more disaggregated level to see if the observed regional heterogeneity can be explained by differences in the sectoral distribution of FDI.

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Appendix

Africa: Algeria, Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Cape Verde, Chad, Congo, Cote d'Ivoire, Egypt, Ethiopia, Gabon, Gambia, Ghana, Guinea-Bissau, Iran, Jordan, Kenya, Madagascar, Malawi, Mali, Mauritania, Mauritius, Morocco, Mozambique, Niger, Nigeria, Oman, Rwanda, Senegal, Sierra Leone, South Africa, Sudan, Swaziland, Syria, Tanzania, Togo, Tunisia, Uganda, Zambia and Zimbabwe.

Latin America and Caribbean: Argentina, Belize, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Peru, Trinidad and Tobago, Uruguay and Venezuela.

Asia: Albania, Armenia, Bangladesh, Belarus, Bhutan, Bulgaria, Cambodia, China, Croatia, Czech Republic, Estonia, Fiji, Georgia, Hungary, India, Indonesia, Kazakhstan, Latvia, Lithuania, Malaysia, Moldova, Mongolia, Nepal, Pakistan, Papua New Guinea, Philippines, Poland, Romania, Solomon Islands, Sri Lanka, Thailand, Tonga, Turkey, Ukraine and Vanuatu.

Tables and Figures

Figure 1. The Development of FDI as a Share of GDP, 1970-2006

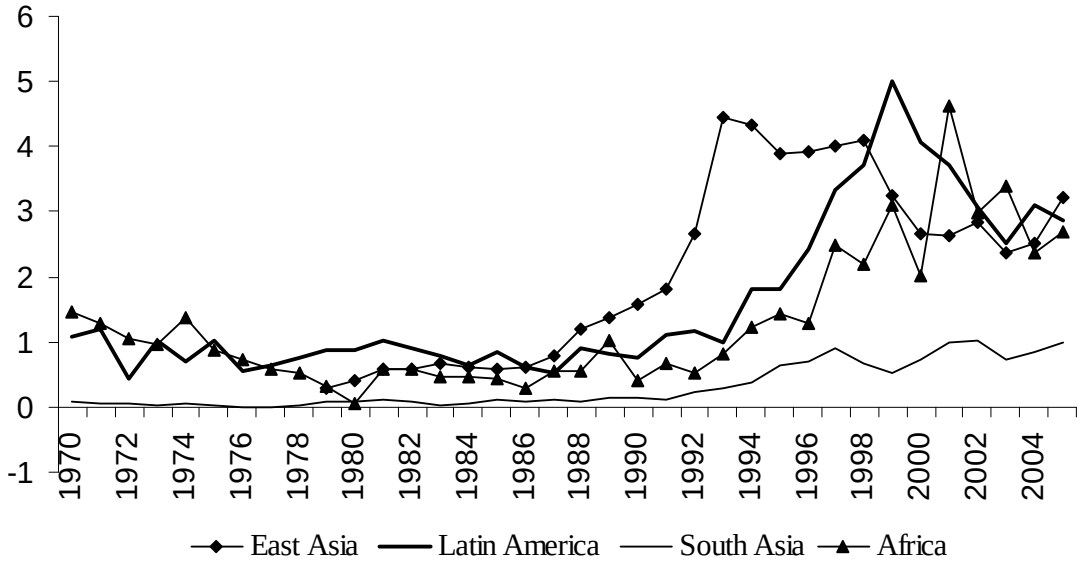

Table 1: Regional Distribution of FDI

	1970-1980	1980-1990	1990-2000	2000-2006
Developing economies (millions)	5922	20580	118185	255648
Africa	15.9	6.4	3.9	4.7
Nigeria	5.4	2.1	1.3	1.0
South Africa	1.6	0.1	0.7	0.9
Latin America	47.6	31.8	35.6	29.6
Argentina	2.2	2.8	5.8	1.7
Brazil	21.4	8.4	8.4	7.5
Mexico	7.6	11.6	7.2	7.9
Asia	29.3	43.3	56.2	53.8
East Asia	7.5	22.4	35.6	38.2
China	0.0	7.9	24.6	22.1
Hong Kong	4.5	10.4	7.6	12.3
South Korea	1.8	1.6	2.1	2.3
South Asia	1.1	1.2	2.0	3.5
South-East Asia	20.8	19.7	18.6	12.0
Indonesia	7.4	1.6	1.8	0.4
Singapore	5.1	9.3	7.2	6.1
Thailand	1.3	2.5	2.7	2.3

Note: Shows FDI as a share of total FDI going to developing countries.
Source: FDI data is from the UNCTAD database (constant 2000 US Dollars).

Table 2: Panel Data Models: Regional Dummies

	Africa	South Asia	East Asia	Latin America
Noorbakhsh and Youssef (2001)	(+/-)			(+/-)
Edwards (1990)			(+)	(+/-)
Asiedu (2002)	(-)			
Jaspersen et al. (2000)	(-)			
Ancharaz (2002)	(+/-)			
Gani (2007)		(-)		
Wilhelms and Witter (1998)	(-)		(+)	
Addison and Heshmati (2003)	(+/-)	(-)	(+)	(+)
Yang (2007)		(-)		
Hein (1992)			(+/-)	(+/-)

Note: (-), (+) and (+/-) indicate a significant negative, a significant positive and an insignificant regional dummy at a 10% significance level, respectively.

Table 3: Regional Studies (Return Variables)

	Africa	Asia	Latin America
Market potential			
GDP	(+/-) Ancharaz (2002)	(+/-) Frenkel et al. (2004)	(+) Bengoa et al. (2003)
	(+) Asiedu (2005,2006)		(+) Frenkel et al. (2004)
	(+) Morisset (2000)		(-) Campos and Kinoshita (2008)
Population size			(+) Tuman and Emmert (1999)
GDP Per capita	(-) Ancharaz (2002)	(+/-) Wezel (2003)	(+) Ferris et al. (1997)
	(+/-) Lemi and Asefa (2003)	(-) Nasser (2007)	(+/-) Tuman and Emmert (1999, 2004)
	(+) Asiedu et al. (2007)	(+) Quazi (2007a)	(+) Campos and Kinoshita (2008)
			(+/-) Wezel (2003)
			(+/-) Nasser (2007)
Growth	(+/-) Ancharaz (2002)	(+/-) Frenkel et al. (2004)	(+/-) Nasser (2007)
	(+/-) Jaspersen et al. (2000)		(+/-) Frenkel et al. (2004)
	(+) Onyeiwu et al. (2004)		(+/-) Tuman and Emmert (1999)
	(+) Naudé and Krugell (2007)	(+) Nasser (2007)	(+) Tuman and Emmert (2004)
Agglomeration			
FDI lagged	(+) Naudé and Krugell (2007)	(+/-) Wezel (2003)	(+/-) Tuman and Emmert (1999)
	(+) Asiedu et al. (2007)	(+) Nasser (2007)	(+) Nasser (2007)
			(+) Tuman and Emmert (2004)
			(+) Wezel (2003)
Urban Population	(+/-) Morisset (2000)		
Factor markets			
Labour market			
Size of labour force	(-) Lemi and Asefa (2003)		
Wages		(-) Wezel (2003)	(+/-) Wezel (2003)
Illiteracy rate	(+) Asiedu (2005, 2006)		
	(+) Lemi and Asefa (2003)		
	(+/-) Morisset (2000)		
	(+) Naudé and Krugell (2007)		
School enrolment		(+/-) Nasser (2007)	(+) Tuman and Emmert (2004)
			(+) Nasser (2007)
			(+/-) Tuman and Emmert (1999)
Value added (productivity)	(+) Lemi and Asefa (2003)		
Natural ressource availability	(+) Morisset (2000)		(+) Campos and Kinoshita (2008)
	(+) Onyeiwu et al. (2004)		
	(+) Asiedu (2005, 2006)		
	(+) Asiedu et al. (2007)		
Capital market			
Domestic investment	(+) Ancharaz (2002)		
	(+) Naudé and Krugell (2007)		
Real interest rate	(-) Lemi and Asefa (2003)		
	(+/-) Onyeiwu et al. (2004)		
Domestic market access			
Infrastructure			
Number of vehicles			(+) Ferris et al. (1997)
Railways/roads			(+/-) Bengoa et al. (2003)
Telephone lines	(+/-) Lemi and Asefa (2003)	(+) Nasser (2007)	(+) Nasser (2007)
	(+/-) Morisset (2000)		
	(+) Asiedu (2005, 2006)		(+) Campos and Kinoshita (2008)
	(+/-) Onyeiwu et al. (2004)		
	(+) Asiedu et al. (2007)		
Economic adjustment period			(-) Tuman and Emmert (1999)
Liberalisation index			(+) Campos and Kinoshita (2008)
Privatisation			(+) Campos and Kinoshita (2008)
Corporate taxes	(-) Onyeiwu et al. (2004)		
Trade taxes	(-) Schoeman et al. (2000)	(-) Wezel (2003)	(+) Wezel (2003)
International openness			
Import			(+) Ferris et al. (1997)
			(+/-) Tuman and Emmert (1999)
Export	(+) Lemi and Asefa (2003)		(-) Ferris et al. (1997)
			(+/-) Tuman and Emmert (1999)
Total trade	(+) Morisset (2000)		(+) Tuman and Emmert (2004)
	(+) Asiedu (2005,2006)	(+/-) Wezel (2003)	(+/-) Wezel (2003)
	(+) Onyeiwu et al. (2004)	(+/-) Nasser (2007)	(+) Nasser (2007)
	(+/-) Ancharaz (2002)		
Trade policies			
Investment treaties	(+/-) Lemi and Asefa (2003)		
MIGA	(-) Lemi and Asefa (2003)		
Free Trade Areas			(+/-) Tuman and Emmert (2004)
International tourists	(+/-) Lemi and Asefa (2003)		
Geography			
Latitude	(+) Naudé and Krugell (2007)		
Elevation	(+/-) Naudé and Krugell (2007)		
Distance or border		(-) Frenkel et al. (2004)	(-) Frenkel et al. (2004)

Note: (-), (+) and (+/-) indicate a significant negative, a significant positive and an insignificant explanatory variable at a 10% significance level, respectively.

Table 4: Regional Studies (Risk Variables)

	Africa	Asia	Latin America
Economic risk			
Inflation	(-) Naudé and Krugell (2007)		(+/-) Tuman and Emmert (1999, 2004)
	(-) Asiedu (2005, 2006)	(+/-) Nasser (2007)	(-) Nasser (2007)
	(-) Onyeiwu et al. (2004)	(+/-) Frenkel et al. (2004)	(-) Campos and Kinoshita (2008)
			(-) Bengoa et al. (2003)
			(+/-) Frenkel et al. (2004)
Variance of inflation	(+/-) Lemi and Asefa (2003)		
Current account balance		(+/-) Nasser (2007)	(+) Nasser (2007)
Exchange rate			
Exchange rate variability	(+/-) Lemi and Asefa (2003)	(+/-) Wezel (2003)	(+/-) Wezel (2003)
	(-) Ancharaz (2002)		(+/-) Tuman and Emmert (1999, 2004)
Fixed exchange rate dummy		(+) Frenkel et al. (2004)	(+/-) Frenkel et al. (2004)
Financial stability			
External debt	(-) Lemi and Asefa (2003)	(+/-) Wezel (2003)	(+/-) Wezel (2003)
	(+/-) Onyeiwu et al. (2004)		(-) Bengoa et al. (2003)
Debt service record	(-) Ancharaz (2002)		(+) Baumgarten and Hausman (2000)
International reserves	(-) Onyeiwu et al. (2004)		
Overall indices			
Index of economic freedom			(+) Bengoa et al. (2003)
ICRG		(+/-) Wezel (2003)	(+) Wezel (2003)
Euromoney		(+) Frenkel et al. (2004)	(+/-) Frenkel et al. (2004)
		(+/-) Wezel (2003)	(+/-) Wezel (2003)
Political risk			
Political instability			
Political risk index	(-) Naudé and Krugell (2007)		(-) Baumgarten and Hausman (2000)
Political violence	(-) Asiedu (2005, 2006)	(+) Nasser (2007)	(-) Nasser (2007)
			(-) Tuman and Emmert (1999, 2004)
Political freedom index	(+) Lemi and Asefa (2003)		(+/-) Ferris et al. (1997)
	(+/-) Onyeiwu et al. (2004)		(+) Tuman and Emmert (2004)
Political rights		(+/-) Nasser (2007)	(+) Nasser (2007)
Executive constraints			(-) Campos and Kinoshita (2008)
Corruption			
Corruption index	(-) Asiedu et al. (2007)		
	(-) Asiedu (2005, 2006)		
Government size	(+/-) Ancharaz (2002)		
	(+) Naudé and Krugell (2007)		
Accountability	(-) Naudé and Krugell (2007)		
Commercial risk			
Investment climate			
Openness to FDI	(+) Asiedu (2006)		
	(+) Asiedu et al. (2007)		
Expropriation (settler mortality)	(+/-) Naudé and Krugell (2007)		
Business environment			
Bureaucratic quality			(+/-) Campos and Kinoshita (2008)
Institutional quality	(+/-) Ancharaz (2002)		
Regulatory burden	(+) Naudé and Krugell (2007)		
Rule of law index	(+) Naudé and Krugell (2007)		(+) Campos and Kinoshita (2008)
	(+) Asiedu (2005, 2006)		
	(+) Asiedu et al. (2007)		
Financial risk index			(+/-) Campos and Kinoshita (2008)

Note: (-), (+) and (+/-) indicate a significant negative, a significant positive and an insignificant explanatory variable at a 10% significance level, respectively.

Table 5: List of Variables

Variable	**Description**	**Source**
GDP	GDP in constant 2000 US dollars	WDI (2007)
Population	Population, total (millions)	WDI (2007)
GDP per capita	GDP per capita in constant 2000 US dollars	WDI (2007)
Growth	Growth of GDP in constant 2000 US dollars	WDI (2007)
Urban population	Urban population (% of total population)	WDI (2007)
Size of labour force	Labour force, total (millions)	WDI (2007)
Labour earning	Estimated earned income (male plus female)	UNDP
Education	Education index (lies between 0 and 1)	UNDP
Fuel	Fuel exports (% of merchandise exports)	WDI (2007)
Ores	Ores and metals exports (% of merchandise exports)	WDI (2007)
Land area	Total land area in square kilometres	WDI (2007)
Return to investment	log(1/GDP per capita)	WDI (2007)
Roads	Total network in kilometres	WDI (2007)
Telephone lines	Telephone mainlines per 1,000 people	WDI (2007)
Internet	Internet users per 1,000 people	WDI (2007)
Taxes	Tax revenue (% of GDP)	WDI (2007)
Import	Import (% of GDP)	WDI (2007)
Export	Export (% of GDP)	WDI (2007)
Total trade	Trade, total (% of GDP)	WDI (2007)
Inflation	Inflation, consumer prices (annual %)	WDI (2007)
Current account balance	Current account balance (% of GDP)	WDI (2007)
Change in exchange rate	Change in real exchange rate: exch(t)-log exch(t-1)	WDI (2007)
Variance of exchange rate	Variance of real exchange rate: std of exch	WDI (2007)
External debt	External debt, total (% of GDP)	WDI (2007)
Debt service record	Debt service, total (% of GNI)	WDI (2007)
Reserves	Reserves, total (includes gold, current US$)	WDI (2007)
Government expenditure	Government final consumption expenditure (% of GDP)	WDI (2007)
Political risk	Std of government expenditure	WDI (2007)
Corruption		Kaufmann et al. (2007)
Voice and accountability		Kaufmann et al. (2007)
Bureaucratic quality		Kaufmann et al. (2007)
Government efficiency		Kaufmann et al. (2007)
Rule of law index		Kaufmann et al. (2007)

Table 6: PcGets Results: Return and Risk Variables (Trade)

	All countries	**Africa**	**Asia**	**Latin America**
GDP per capita		-0.001***		
		[0.0001]		
Growth	0.423**	0.419***	1.330***	0.417***
	[0.186]	[0.119]	[0.383]	[0.043]
Urban population			0.188***	-0.055***
			[0.0669]	[0.003]
Earn	-0.205*		-0.695***	
	[0.107]		[0.197]	
Ores				0.055***
				[0.004]
Landarea		0.738***		
		[0.233]		
Roads		-0.014**		
		[0.007]		
Telephone	0.031***			0.026***
	[0.011]			[0.002]
Tax rate	-0.009			
	[0.007]			
Trade	0.010	0.033***		0.014***
	[0.011]	[0.006]		[0.003]
Inflation	-0.016***	-0.005***	-0.041***	-0.217*
	[0.003]	[0.001]	[0.007]	[0.001]
Current account	-0.339***		-0.675***	0.185***
	[0.097]		[0.166]	[0.033]
External debt	-2.861**			-1.095***
	[1.092]			[0.331]
Change in exchange rate	-0.077**		-0.270***	-0.002***
	[0.031]		[0.071]	[0.006]
Variance of the exchange rate	-0.226**		0.805**	0.134***
	[0.110]		[0.361]	[0.021]
International reserves		-3.475**		
		[1.602]		
Government expenditure		6.047**		
		[2.350]		
Corruption	-3.181**			-1.728***
	[1.395]			[0.263]
Law	3.387***	0.677*		0.759***
	[1.241]	[0.344]		[0.237]
Political rights			1.682**	
			[0.712]	
Voice and accountability			7.202***	
			[1.759]	
RSS	816	18	344	4
Number of observations	100	43	35	22
Adjusted R-squared	0.39	0.78	0.64	0.88

Note: A constant term is included but not reported. Diagnostic tests include residual autocorrelation, ARCH, heteroscedasticity, functional form mis-specification and non-normality. ***, ** and * indicate significance on a 1, 5 and 10 percent significance level. Standard errors are in paranthesis.

Table 7: PcGets Results: Return and Risk Variables (Import and Export)

	All countries	**Africa**	**Asia**	**Latin America**
GDP per capita		-0.001***		
		[0.0003]		
Growth	0.431**	0.412***	1.330***	0.472***
	[0.207]	[0.118]	[0.383]	[0.041]
Urban population			0.188***	-0.056***
			[0.0669]	[0.003]
Earn			-0.695***	
			[0.197]	
Ores				0.066***
				[0.005]
Landarea		0.556**		
		[0.218]		
Roads		-0.020**		
		[0.007]		
Telephone	0.035***			0.034***
	[0.012]			[0.003]
Import	0.0061	0.064***		0.037***
	[0.042]	[0.011]		[0.005]
Inflation	-0.014***	-0.005***	-0.041***	-0.003***
	[0.003]	[0.001]	[0.007]	[0.001]
Current account	-0.338***		-0.675***	0.171***
	[0.105]		[0.166]	[0.035]
External debt	-2.553**			-0.747*
	[1.117]			[0.340]
Change in exchange rate	-0.063**		-0.270***	-0.029***
	[0.029]		[0.071]	[0.006]
Variance of the exchange rate	-0.227**		0.805**	0.161***
	[0.111]		[0.361]	[0.021]
International reserves		-5.112***		
		[1.915]		
Government expenditure		7.910***		
		[2.561]		
Corruption	-3.454**			-1.557***
	[1.372]			[0.191
Law	2.870**			
	[1.271]			
Political rights			1.682**	
			[0.712]	
Voice and accountability			7.202***	
			[1.759]	
Number of observations	100	43	35	22
Adjusted R-squared	0.38	0.78	0.64	0.87

Note: See Table 6.

Chapter 2

Measuring Idiosyncratic Risk: Implications for Capital Flows

Measuring Idiosyncratic Risk: Implications for Capital Flows*

Eva Rytter Sunesen†
Department of Economics, University of Copenhagen

Abstract

This paper offers a refined risk measure based on the variance of GDP growth. First, we condition growth on structural characteristics of the host country that move only slowly and therefore can be partly predicted by the investor. Second, we adjust for the systematic components due to global and regional interdependence between alternative investment locations. The decomposition of risk into its systematic and idiosyncratic components reveals that not only are African countries on average characterised by a larger conditional risk than Asian and Latin American countries, but the idiosyncratic risk factor also represents a larger share than in other developing countries. Finally, using a general-to-specific methodology, we find that both economic and political risk factors are important elements in the investment decision. The commercial aspect of risk is, however, poorly defined.

Keywords: Foreign direct investment, risk decomposition
JEL classifications: E32, F21, O16, C23

1 Introduction

Foreign direct investment (FDI) has become an important source of capital in developing countries during the last decade with FDI inflows more than tripling since the mid 1990s. Despite efforts to improve the investment climate, see UNCTAD (1999), the regional distribution of FDI has been heavily biased against the poor African countries. This means that in spite of absolute increases in FDI inflows throughout the period, Africa has experienced a drop in FDI inflows relative to other developing countries.

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†Department of Economics, University of Copenhagen. Studiestræde 6, 1455 Copenhagen K, Denmark. E-mail address: eva.rytter.sunesen@econ.ku.dk.

While a large part of the empirical literature on FDI has focussed mainly on the traditional low-return explanation of insufficient FDI inflows to certain developing countries, more recent studies have applied various risk measures to control for the country risk of investing abroad. The importance of risk stems from the fact that, in the face of the uncertainty connected to foreign investments, the objective of investors is to maximise the *expected* return of their investment. This means that risk becomes a critical element in the investment decision. Since aggregate data on returns to FDI is generally unavailable for a satisfactory number of countries for a sufficient number of years, it is impossible to capture risk by the variance of such returns. Basically, empirical papers on FDI and risk can be grouped into two according to the way they proxy for country risk.

First, a large part of the literature has included various economic, political and commercial risk measures. While there seems to have been reached a consensus on the importance of economic risk (and which proxies to include), the inclusion of political and commercial risk measures has been more ad hoc and a large variety of proxies have been tested. The second branch of the literature has applied a selection of volatility measures to capture risk. Suggested volatility measures have been based on inflation, exchange rates or terms of trade, but the most frequently used risk proxy is the variance of GDP growth. This paper provides a bridge between these two empirical methodologies.

Since the variance of GDP growth can only be interpreted as idiosyncratic country risk when events are unpredictable, this paper offers a refinement that serves to take out the structural and systematic components of the variance of GDP growth. We proceed in two steps. First, we derive a conditional risk measure by drawing on the augmented Solow (1956) growth model to account for the structural characteristics of the host country that move only slowly and therefore can be partly predicted by the investor. Second, by using a principal components analysis (PCA) we adjust for the systematic risk caused by global and regional business cycle effects. In the end, this exercise allows us to decompose conditional risk into its global, regional and idiosyncratic risk components.

Results show that not only are African countries on average characterised by a higher conditional risk, but idiosyncratic country risk also constitutes a larger share of total risk as compared with Asian and Latin American countries. This means that the puzzling combination of relatively high rates of return in Africa, the average return on US investment to Africa over the period 1983-97 was 23% compared with 21% for Asia & Pacific and 12% for Latin America & Caribbean as documented in UNCTAD (1999), and low inflows of FDI to African countries. This paper suggests that the relevant measure for comparison should be the expected rate of return, that is returns adjusted for idiosyncratic country risk.

As a final exercise we are interested in systematically analysing how the refined risk measure correlates with the economic, political and commercial risk measures suggested in the empirical FDI literature. Overall, we conclude that both economic and political risk

variables are important determinants of idiosyncratic risk whereas the commercial aspects of risk are poorly defined. Rather than including various risk measures on an ad hoc basis, our results indicate that the ability of a country to service its debt, the current account balance, government consumption, democratic accountability and external conflicts are important determinants of risk.

The paper proceeds as follows. Section 2 derives a refined risk measure that conditions total risk on slowly moving economic fundamentals of the host economy and takes the systematic risk components due to global and regional integration into account. Using econometric tools, we are then able to decompose total risk into its conditional, systematic and idiosyncratic components. Section 3 applies a general-to-specific framework to select those economic, political and commercial risk measures that best describe idiosyncratic risk. Finally, Section 4 summarises and concludes.

2 A Refined Measure of Risk

The increased attention towards explaining FDI flows by *expected* returns has highlighted the need to take risk into account. Since aggregate data on returns to FDI is generally unavailable it is impossible to capture risk by the variance of such returns. The starting point in this paper is the variance of GDP growth to capture overall risk, which has been done by Hausmann and Gavin (1995), Ramey and Ramey (1995), Servén (1998), and Calderón, Loyaza and Servén (2003) among others. The focus on GDP growth is motivated by the new growth literature, which argues that GDP growth per worker reflects the most important elements of economic policy and performance. Not only does it reflect the market potential of an economy (the strength of local demand), as highlighted by Guiso and Parigi (1998), but eventually all inefficiencies, instabilities and incapabilities of an economy will show up in the growth rate. This argument is confirmed by Calderón, Loayza and Servén (2003) who find that when stock-market returns are regressed on other underlying indicators (inflation, exchange rate, political and financial risk), GDP growth takes the bulk of the explained variance of returns.

Yet, it is quite obvious that variability only amounts to risk when events are unpredictable and a refined measure of risk is therefore required.[1] First, we derive a conditional risk measure by taking out the part of GDP growth caused by growth determinants that move only slowly and therefore can be partly predicted by the investor. Second, since countries are interdependent there will be some systematic components in the local return to investment that will depend on common global and regional factors. Adjusting for such structural and systematic factors will give us an improved measure of idiosyncratic

[1] This statement was stressed by Servén (1998) who draws the distinction between sample variation and uncertainty. The argument is that the former may overstate the latter by including not only truly unpredictable innovations to the variables of interest, but possibly also (cyclical) movements partly predictable from the past.

country risk.

2.1 Adjustment for Economic Fundamentals

Proxying the return to investment with GDP growth, we can decompose actual return into a predictable part, $x'_{it}\beta$, and an unpredictable part, ε_{it},

$$\Delta \ln(y_{it}) = x'_{it}\beta + \varepsilon_{it}, \tag{1}$$

where y_{it} is real GDP per worker in country i at time t, x_{it} is a vector of economic fundamentals identified from the neoclassical and endogenous growth literature, and ε_{it} is the growth residual.[2] While the variance of growth has previously been used as a measure of risk, this paper has made the case that $\sigma^2_{\varepsilon i}$ is a better proxy for country risk. We will call this conditional risk since we condition risk on slowly moving factors partly predictable from their own past.

The methodology behind the growth regression is based on the convergence literature, most notably Islam (1995), where the growth regression in a panel data setting can be presented as

$$\Delta \ln(y_{it}) = \gamma_i + (\alpha - 1)\ln y_{it-1} + \beta_0 \ln(n_{it} + g + \delta) + \beta_1 \ln(inv_{it}) + \beta_2 \ln(open_{it}) + \varepsilon_{it}, \tag{2}$$

where γ_i is an unobserved country-specific time-invariant constant reflecting among other things the initial level of efficiency, possibly influenced by institutional settings, geographic characteristics and cultural norms, and where the lagged dependent variable, $\ln y_{it-1}$, captures the tendency of an economy to converge to its steady state. n_{it} is the growth rate of the labour force, g is technological advancement and δ is the rate of depreciation. In line with Mankiw, Romer and Weil (1992) we assume $(g + \delta)$ to be the same for all countries and equal to 0.05. Capital accumulation is the main driver of growth in the traditional Solow model and we therefore include total investment as a share of GDP, inv_{it}. Finally, following Beaudry, Collard and Green (2005) we include total trade as a share of GDP, $open_{it}$. Income per capita, investment, openness and population are from Penn World Tables 6.1. Due to errors in the demographic time series, as documented by Dowrick (2005), data on the labour force are taken from the World Development Indicators (2005).[3] The model applies annual data for a sample of 126 developed and

[2] We assume that growth and return are linearly and positively correlated. However, foreign investors might face increasing factor prices and scarce resources in countries where FDI inflows have increased a lot over a short period of time. This means that there will be some second order effects that are not captured by the simple linear relationship defined in this paper.

[3] Human capital enters as a fundamental growth determinant in the augmented Solow model. However, since typical human capital variables (average years of schooling or school enrolment rates) are available only with five year intervals such variables have been excluded. In addition, we do not include time

Table 1: Growth Determinants

	POLS	FE	GMM-DIF	GMM-SYS
constant	0.009	0.123**		-0.061
	[0.027]	[0.049]		[0.059]
$\ln(y_{t-1})$	-0.004**	-0.053*	-0.186***	-0.005
	[0.002]	[0.007]	[0.040]	[0.006]
$\ln(n+g+d)$	-0.019**	-0.037***	-0.045	-0.058***
	[0.009]	[0.012]	[0.045]	[0.022]
$\ln(inv)$	0.015***	0.011***	-0.055***	0.023***
	[0.003]	[0.004]	[0.021]	[0.006]
$\ln(open)$	-0.011	0.004	0.041**	-0.015***
	[0.002]	[0.006]	[0.016]	[0.005]

Note: Dependent variable is growth in GDP per worker. Heteroscedastic consistent standard errors in brackets. *** significant at 1%, ** significant at 5%, * significant at 10%.

developing countries.

Various methods have been used to estimate the growth regression. In the presence of unobserved country-specific effects and a lagged dependent variable, Hsiao (1986) shows that the pooled OLS estimate (POLS) of the coefficient on the lagged dependent variable is upwards biased, and Nickell (1981) shows that the Fixed Effects (FE) estimator is downwards biased. We therefore turn to the first-differences Generalised Method of Moments (GMM-DIF) estimator, originally developed by Holtz-Eakin, Newey and Rosen (1988) and Arellano and Bond (1991), which produces consistent estimates in the dynamic growth relation.

However, when the time series are persistent (α close to unity) the GMM-DIF estimator is poorly behaved. The reason is that, under such conditions, lagged levels of the variables are only weak instruments for subsequent first-differences. We therefore turn to the system GMM (GMM-SYS) estimator suggested by Arellano and Bover (1995) and Blundell and Bond (1998). All estimators are based on the efficient two-step estimator to allow for heteroscedasticity in the residuals. Since the two-step GMM estimators have the disadvantage of converging to their asymptotic distribution relatively slowly we compensate by using the finite-sample correction to the two-step covariance matrix derived by Windmeijer (2005). Investment, openness and population growth rates are treated as endogenous variables in the GMM estimators, which means that instruments should be lagged two periods or more to be valid. All regressions are carried out using STATA. Results are reported in Table 1.

The results are largely in line with other empirical studies; see for example Bond, Hoeffler and Temple (2001). Unexpectedly, *open* enters negatively in the regression, which is also the case in the Beaudry, Collard and Green (2005) IV5 regression for the period

dummies since these are not predictable by foreign investors. Tests show, however, that our results are robust to the inclusion of time dummies.

1978-98. One explanation could be a business cycle effect due to long-term contracts, which means that trade lags behind income in a boom. Working with annual data this means that the covariance between openness (trade as a share of GDP) and growth will be negative. It is worth noticing that the coefficient on the lagged dependent variable is lower than in other studies. This is because we use annual observations rather than the typical 4 or 5-year averages. In this case the persistency of the income data will be higher (high α) and, consequently, that the rate of convergence will be lower. Given the high persistence in the income data we base our subsequent analysis on residuals from the GMM-SYS estimator.

2.2 Adjusting for Global and Regional Interdependence

Albuquerque, Loayza and Servén (2002) and Kose, Otrok and Whiteman (2003), among others, argue that the close trading and investment relationships between countries give rise to a global business cycle. This means that the global investment climate will affect the return to investment in individual countries and regions. In our context, the presence of a global return component means that a component in the unpredictable return, ε_{it}, varies systematically across countries. To capture this, we define a single-index model based on the assumption that the common return component, ω_t, enters linearly in the country-specific return.[4] Now, the unpredictable return component (the growth residual) can be written as

$$\hat{\varepsilon}_{it} = \eta_{i\omega}\omega_t + e_{it}, \qquad e_{it} \sim IID(0, \sigma^2_{ei}), \tag{3}$$

where $\eta_{i\omega}$ reflects the degree to which global return factors spill over into local return (the degree of global integration). $\eta_{i\omega}\omega_t$ can be interpreted as the part of local return that is attributable to the global investment climate. Now, e_{it} is the local return adjusted both for the structural characteristics of the host economy and the systematic component due to global investment conditions. $\hat{\sigma}^2_{ei}$ therefore gives a refined measure of country risk.

Not only are returns in individual countries affected by global factors but countries belonging to the same region are also likely to be affected by common shocks. The regional return component could be explained by the fact that many multinational firms locate in one country but serve markets in the whole region. Also political, economic and social ties between countries within a region (often enhanced by the signing of Regional Integration Agreements) mean that shocks to one country spill over to the other countries in the region.

[4] For simplicity the degree of global and regional spillovers are assumed to be constant over time. This is not completely in line with empirical observations since one of the most significant features about the global economy of the past few decades has been the move towards closer and more open trading systems and investment relationships between countries. However, this assumption is necessary to make the index model operational.

The existence of a regional market seeking motive of foreign investors has been confirmed by Veugelers (1991), Chakrabarti (1997, 2003), Méon and Sekkat (2002), Sethi et al. (2003), Jaumotte (2004), and Carstensen and Toubal (2004), and the importance of the macroeconomic and political situation of neighbouring countries has been examined by Ades and Chua (1997), and Easterly and Levine (2000).

To capture the regional aspect of local return, we define an indicator of regional belonging, I_{ik}, that takes on the value one if country i belongs to region k and zero otherwise. We then define a regional return component, τ_{kt}, common to all countries in region k but varying over time, that enters linearly in the local return of country i

$$\hat{e}_{it} = \sum_{k=1}^{K} \eta_{i\tau_k} I_{ik} \tau_{kt} + u_{it}, \qquad u_{it} \sim IID(0, \sigma_{ui}^2), \tag{4}$$

where $\eta_{i\tau_k}$ is the spillover from the regional investment climate to the local, and τ_{kt} is return in region k at time t. Now, $\hat{\eta}_{i\tau_k}\hat{\tau}_{kt}$ can be interpreted as the part of country return that is attributable to the investment climate in region k. Under such circumstances $\hat{\sigma}_{ui}^2$ is the relevant measure of idiosyncratic country risk since it is adjusted for both the structural and systematic components.

Empirically, $\hat{\omega}_t$ can be estimated as the first principal component of $\hat{\varepsilon}_{it}$, where $\hat{\eta}_{i\omega}$ is the factor loading reflecting the degree of global spillover. Since the PCA methodology requires full time series for the growth residual, the 126 countries from the growth regression are reduced to 92 developed and developing countries that enter the global PCA. It is worth noticing that the sign of $\eta_{i\omega}$ and ω_t are not identified individually. Based on the belief that the United States is a dominant player in the global economy, we have normalised the sign of $\eta_{i\omega}$ and ω_t to ensure that $cov(\omega_t, \varepsilon_{USA,t}) > 0$.

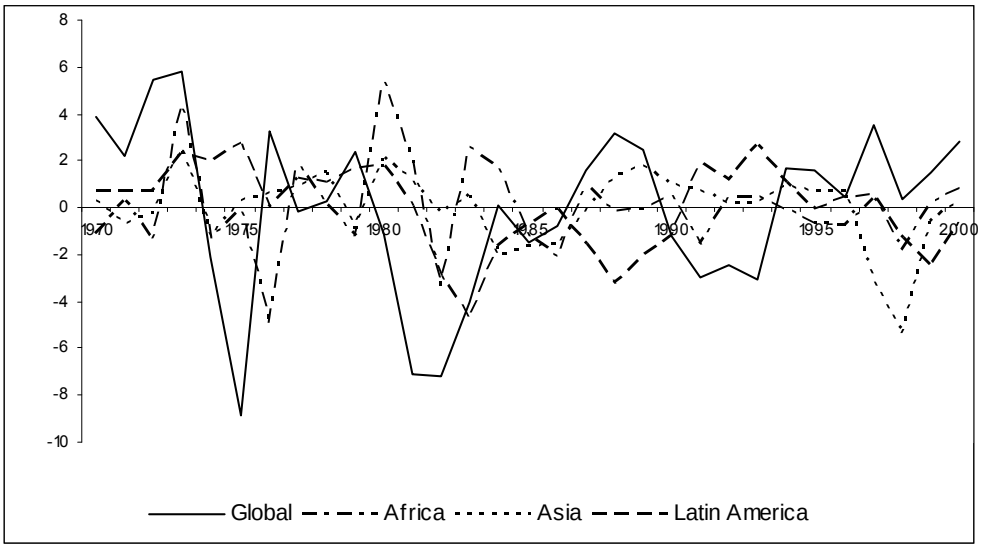
By symmetry, $\hat{\tau}_{kt}$ can be obtained as the first principal component from a region-by-region PCA of $\hat{e}_{it}$, where $\hat{\eta}_{i\tau_k}$ is the factor loading reflecting the degree of regional spillover. Again, the sign of $\hat{\tau}_{kt}$ and $\hat{\eta}_{i\tau_k}$ are not identified individually and we normalise the sign to ensure that the largest economy in the region (in terms of GDP) is positively correlated with regional return, $cov(\tau_t, e_{DYNAMO,t}) > 0$. The argument is that the largest economy often functions as a regional dynamo and we wish to ensure that there is a positive connection between the dynamo and the regional business cycle. The dynamos are South Africa (Africa), Brazil (Latin America) and China (Asia).

Figure 1 depicts the time pattern of the global and regional principal components, $\hat{\omega}_t$ and $\hat{\tau}_{kt}$. On average, the global component explains 14% of total variance. The Asian principal component is the strongest explaining 21% of the residual variance, whereas the Latin American and African components explain 17% and 11%, respectively. The global return component is quite volatile and tests reject that it is constant over time. The global return picks up the economic downturns in conjunction with the two oil crisis in 1973 and 1979. It also shows a more stabilised economy during the 1980s as well as the

upturn in the mid 1990s.

Tests also reject the hypothesis that the regional return components are constant over time. During the first two decades, the African return component was quite volatile but the region has stabilised during the late 1980s and 1990s at a relatively high level compared with Asia and Latin America. The Asian return component, on the other hand, has been stable and most often positive except for the Asian crisis that comes through strongly in the return component in the late 1990s. Finally, the Latin American debt crisis in the early 1980s shows up clearly in the regional return.

Figure 1. Global and Regional Principal Components



Note: The figure shows the development in $\hat{\omega}_t$ and $\hat{\tau}_{kt}$ over time. The principal components have been normalised to ensure that the global component is positively correlated with US return and that the regional component is positively correlated with the dominant country in the particular region.

The PCA methodology ensures that the covariance between the two indices is zero ($E[\omega_t \tau_{kt}] = 0$), and that the residual is uncorrelated with each index ($E([\omega_t u_{it}] = E([\tau_{kt} u_{it}] = 0$).[5] Together this means that conditional risk can be decomposed as

$$\sigma^2_{\varepsilon i} = \eta^2_{i\omega}\sigma^2_{\omega} + \eta^2_{i\tau_k}\sigma^2_{\tau_k} + \sigma^2_{ui}, \tag{5}$$

where $\eta^2_{i\omega}\sigma^2_{\omega}$ is the global risk factor, $\eta^2_{i\tau_k}\sigma^2_{\tau_k}$ is the regional risk factor and σ^2_{ui} is the idiosyncratic country risk factor. Table 2 shows the risk decomposition for the three regions.[6]

[5] Since the regional return components, τ_{kt}, are derived from PCA on a region-by-region basis, the correlation between the regional return components is not zero by construction. However, the correlations turn out to be low which is not surprising given the correction for a common factor in the global PCA analysis.

[6] Individual results for the 67 developing countries for which coherent data was available can be obtained from the author upon request.

Table 2: Risk Decomposition

	Conditional $\sigma^2_{\varepsilon i}$	**Global** $\eta^2_{i\omega}\sigma^2_{\omega}/\sigma^2_{\varepsilon i}$	**Regional** $\eta^2_{i\tau_k}\sigma^2_{\tau_k}/\sigma^2_{\varepsilon i}$	**Idiosyncratic** $\sigma^2_{ui}/\sigma^2_{\varepsilon i}$
Africa	0.450	0.056	0.112	0.833
Latin America	0.212	0.120	0.152	0.728
Asia	0.118	0.074	0.216	0.711

Note: Decomposes conditional risk into the global, regional and idiosyncratic components.

On average, the conditional risk of investing in Africa (0.450) is significantly higher than investing in Latin America (0.212) or in Asia (0.118). The Latin American countries are the most affected by global conditions: in Latin America the global risk factor explains 12% of the total variance as opposed to 7% in Asia and 6% in Africa. On a regional basis, the Asian spillover effect is the strongest, and the Asian return factor explains close to 22% of the total variance. In Latin America and Africa the regional factor accounts for 15% and 11%, respectively. Overall, this means that idiosyncratic country risk accounts for 84% of total risk in Africa, but only 73% and 71% in Latin America and Asia, respectively. The high proportion of idiosyncratic high in total risk is in line with Kose, Otrok and Whiteman (2003). Since idiosyncratic risk is the relevant measure of country risk, the low level of investment in African countries might be explained not only by a large total risk but more importantly by a large proportion of conditional risk being idiosyncratic risk.

3 What Determines Country Risk?

Having now adjusted for the structural part of country risk due to economic fundamentals as well as the systematic risk components due to global and regional business cycle synchronisation, we are left with a measure of idiosyncratic country risk that enables us to carry out an analysis of which factors influence idiosyncratic risk. This section therefore applies econometric tools to select among the various risk measures included in the empirical FDI literature the most significant determinants of country risk. That is, we estimate

$$\hat{\sigma}^2_{ui} = x_i'\beta + \epsilon_i, \tag{6}$$

where x_i is a vector of economic, political and commercial risk measures.[7] Where nothing else is mentioned, the variables have been calculated as averages (or variances) over the time period 1970-2000.[8] Data availability means that we end up with 35 potential risk

[7] A full survey of the applied risk measures can be obtained from the author upon request. We include in our list of explanatory variables as many as possible of the suggested risk measures. However, since some papers focus on bilateral FDI flows, include only a selection of countries (for example transition economies) or calculate their own risk measures using econometric tools (such as GARCH or factor analysis) we will not be able to collect all the variables applied in the FDI literature.

[8] Notice than some of the variables are available only for the latter part of the period and this might

measures for a cross-section of 60 developing countries.

3.1 Description of Variables

Following Nordal (2001) we divide country risk into economic, political and commercial risk. Economic risk is risk related to the macroeconomic development of the host country that may influence the profitability of an investment. Political risk is the uncertainty associated with changes in government policy upon the cash flow accruing to firms and investors. Commercial risk is risk related to the specific investment, such as the risk related to the fulfilment of contracts with private companies and local partners.

Economic risk is mainly related to exchange rate risk, inflation and economic instability. Exchange rate risk contributes to transfer risk (the risk of potential restrictions on the ability to remit funds across national borders) since a depreciating real exchange rate means that the real value of the foreign investment will be undermined. In line with Ancharaz (2002), Deichmann (2001), Kamaly (2002) and Wezel (2003) we therefore include a measure of exchange rate variability. Given the non-stationarity of the real exchange rate we take the variance of the log-difference rather than the level (VREXCH). Also, as argued by Lemi and Asefa (2003) and Garibaldi et al. (2002), a constant real exchange rate is preferred by foreign investors since it is a sign of economic stability. We therefore supplement with the average log-difference of the real exchange rate (CREXCH).

A high rate of inflation often results from excessively expansive monetary and fiscal policies. A record of high and unpredictable inflation creates uncertainty regarding the net present value of a costly long-term investment, and potential direct investors may perceive difficulty even in making short-term pricing decisions. Hence, we take the frequently applied level of inflation (INFL) as well as the variance of inflation (VINFL) as suggested by Lemi and Asefa (2003).

An economically stable economy will be relatively more attractive. A highly indebted country, measured by external debt as a share of GDP (EXDEBT), the debt-service ratio (DEBTSERV) or long-term debt as a share of GDP (LONGDEBT), induces investors to anticipate future tax liabilities to service the debt and to expect political turmoil. Another measure of economic stability, applied by Kamaly (2002) and Onyeiwu and Shrestha (2004), is the availability of international reserves (INTRES) since foreign investors regard large international reserves as reflecting a vital host economy. Finally, the government deficit as a share of GDP (DEFICIT) and the current account balance as a share of GDP (CACCOUNT) have been used as indicators of government credibility since the presence of such imbalances may weaken the availability of external credit and spur expectations of higher future tax liabilities.

cause problems in identifying a significant association with idiosyncratic risk. However, these variables have nevertheless been applied in the empirical literature which is why they are included here.

The importance of **political risk** has been increasingly acknowledged since the late 1990s. Within the set of political risk measures one can distinguish between indicators of political instability, corruption and democracy. Political instability is likely to have an impact on foreign investors for several reasons. First, the emergence of revolutionary movements (or civil wars) in host countries has the capacity to destruct private property and increase uncertainty about the security of property rights, a key consideration for firms holding non-liquid assets. Second, such episodes may undermine the production of goods, transportation of products and sales in domestic markets. Third, such incidents may disrupt the economic process and postpone important reforms.

We capture political instability by the Kaufmann et al. (2005) index of political instability and violence (STABILITY) as well as the standard deviation of the share of government consumption in GDP (GOVCON) applied by Ancharaz (2002).[9] In addition, we include selected ICRG subcomponents: the government's ability to carry out its declared programs and its ability to stay in office (GOVSTAB), internal political violence and civil disorder (INTERNAL), external conflicts (EXTERNAL), military participation in government (MILITARY), religious tensions (RELIGION) and ethnic tensions due to racial, nationality or language divisions (ETHNIC).

Even in the presence of a conductive macroeconomic environment, corruption can deter investors from doing business. Corruption distorts the economic and financial environment thereby raising operating costs, it reduces the efficiency of government and business by slowing down the bureaucratic process, and it destabilises the political process. Three measures of corruption have been added. First, is the Kaufmann corruption index (CORRUPTION), which measures the exercise of public power for private gain. Second, we add the ICRG assessment of corruption within the political system (POLCOR). Finally, we take government consumption as a share of GDP (GCON) based on the argument put forward by Ancharaz (2002), Asiedu (2002) and Onyeiwu (2003) that it indicates economic distortions, government inefficiency and corruption.

Democracy is another aspect of a sound political environment. Authoritative regimes are often associated with a greater risk of policy reversals, due for example to the dictator's own desire, the need to raise public support through populist measures or simply coups. Democratic regimes are also more likely to respect the rule of law and property rights.[10] To capture the effects of democracy on risk, the voice and accountability variable (VOICE) from Kaufmann et al. (2005) reflecting political, civil and human rights has been collected. In addition, the indicators from the Freedom House index have been included individually: civil liberties (CIVIL), political rights (POLRIGHTS) and democracy

[9] The argument for including the latter stems from Brewer (1985) who argues that government agencies are marked by a high degree of inertia and are unlikely to change except as a result of substantial shocks. He therefore suggests that deviations of fiscal indicators (such as government spending) from their trends can be used as a measure of government policy risk. This risk measure was first used by Ancharaz (2002).

[10] See Onyeiwu and Shrestha (2004) for further references on the impacts of democracy.

(FHDEMOC). To supplement, we include the ICRG measure of democratic accountability (ACCOUNT) to capture the degree of tension within a country. Finally, the Marshall and Jaggers (2002) institutionalised democracy index (PDEMOC) and the Vanhanen (2000) index of democratisation (VDEMOC) have been added to our list of political risk measures.

Commercial risk can be divided into measures of the quality of governance, rule of law indicators and more specific variables reflecting the investment climate. The quality of governance is first of all captured by the Kaufmann et al. (2005) indicator of government effectiveness (EFFECT) supplemented with the "bureaucratic quality" indicator from the ICRG (BUREAU).

The rule of law is the most frequently used commercial risk measure. The strength and impartiality of the legal system and popular support for the law reflect the degree to which citizens are willing to accept the established institutions for making and implementing laws and adjudicating disputes. The strength and impartiality of the legal system and popular observance of the law are captured by the Kaufmann et al. (2005) rule of law indicator (LAW) and the ICRG law and order indicator (ORDER).

Indicators of the investment climate include an amalgamate of factors more directly relevant to the foreign investor. A concrete measure of the investment climate is the Kaufmann (2005) regulatory quality indicator (QUALITY), which measures the incidence of market-unfriendly policies. Also, we supplement with two ICRG subcomponents. First is the measure of socioeconomic conditions (SOCIO), which assesses the socioeconomic pressures at work in the society (unemployment, consumer confidence and poverty) that could constrain government action or fuel social dissatisfaction. Second, we include the investment profile component (PROFILE), which is an assessment of factors affecting contract viability/expropriation, profits repatriation and payment delays. Finally, we add the Heritage Foundation property rights index (PRIGHTS).

3.2 Methodology and Results

In view of the large set of (possibly correlated) potential determinants of country risk, it is a challenge to maintain a reasonable degree of parsimony while avoiding misspecification of the model. To deal with this, we use a general-to-specific model selection approach, which enables us to "test down" among the large set of potential right-hand-side variables. We use the *PcGets* software, which automatically selects an undominated, congruent model where statistically insignificant variables are eliminated and where diagnostic tests check the validity of reductions to ensure a congruent final selection. There are many ways in which a model can be simplified, so *PcGets* selects a multipath search strategy, exploring the consequences of every initially-feasible path. We refer to Hendry (1995, Chapter 9) for further details on the methodology.

Initially, we test the economic, political and commercial risk models separately and

the results are reported in Table 3 underneath. Column 1 shows that the external debt (EXDEBT), the debt service ratio (DEBTSERV), international reserves (INTRES) and the current account (CACCOUNT) turn out to be robust and significant economic determinants of idiosyncratic country risk. As expected highly indebted countries with poor debt services are perceived more risky since future tax liabilities are anticipated to be higher. Likewise, a positive current account balance is indicative of a stable economic environment and thus of lower risk. Surprisingly, the availability of international reserves increases risk rather than lowering it. Since this result does not carry over into the combined model in Column 4, we interpret the positive sign as being indicative of an omitted variable bias.

In Column 2, four out of the 18 proposed political risk measures turn out robust. Government consumption as a share of GDP (GCON) reflects economic distortions, government inefficiency and corruption, and its positive correlation with risk is therefore to be expected. The civil liberty variable (CIVIL) ranges from one to seven where small numbers indicate an established and generally equitable system of rule of law. The positive correlation with idiosyncratic risk confirms the perception that countries with strong civil liberties are perceived less risky. The Vanhanen (2000) index of democratisation (VDEMOC) and the ICRG measure of democratic accountability (ACCOUNT) both capture the stabilising effect of democracy. They are rated so that high values indicate a more democratic regime and we would therefore expect them to enter negatively in the regression. The fact that VDEMOC has a positive sign suggests that as soon as we take the accountability aspect of democracy into account, VDEMOC actually captures something that is positively correlated with risk. However, as we will see from Column 4, the significance of this variable is not robust to the merger of the three models and we will therefore not go into details with this preliminary and unstable result.

From Column 3 we see that only two out of the eight commercial risk variables turn out to be significant. Regulatory quality, high values of QUALITY, lowers risk since it indicates the incidence of market-friendly policies. Likewise, a high value of PROFILE indicates good contract enforcement and low risk of expropriation, profits repatriation and payment delays. The explanatory power of the commercial risk variables is rather low and overall we must conclude that the proposed commercial risk measures are not very successful in describing idiosyncratic risk. This is confirmed in Column 4 where none of the commercial risk proxies enter the combined model.

Column 4 shows that once we merge the three models DEBTSERV, ACCOUNT, GCON and ACCOUNT stay significant while the remaining variables from Column 1-3 are not robust to the inclusion of other risk variables. On the other hand, the prevalence of external conflicts (EXTERNAL) becomes a significant determinant of idiosyncratic country risk. Interestingly, when we carry out the general-to-specific exercise using total risk, the variance of GDP growth, $\hat{\sigma}^2_{\Delta \ln(y_{it}),i}$, as the dependent variable

$$\hat{\sigma}^2_{\Delta \ln(y_{it}),i} = x_i'\beta + \epsilon_i, \tag{7}$$

only the debt service ratio, the current account balance and government consumption turn out significant and robust. This is in line with Persson and Tabellini (2006) who find that democracy has no direct effect on growth but there is a positive indirect effect via higher expected returns. However, once we adjust for the structural and systematic components of risk we are able to pick up an effect of democratic accountability on idiosyncratic risk.

Overall, the five significant risk measures account for close to 60 per cent of idiosyncratic risk. Since there are obviously missing variables and serious endogeneity issues, we need to turn to instrumental variable estimation methods, see for example Persson and Tabellini (2006), in order to determine the direction of causality. This lies beyond the scope of this paper. We conclude that several of the suggested individual risk measures correlate significantly with idiosyncratic risk but that one needs to be careful in selecting individual measures. Our results also indicate that studies that focus solely on one type of risk (typically economic risk) leave out important explanatory variables resulting in biased and inconsistent results.

4 Summary and Conclusions

Although the inflow of FDI to developing countries has increased tremendously during the last decade, the regional distribution of such inflows has been heavily biased against the poor African countries. Empirical observations presented in this paper suggest that the uneven distribution of FDI cannot be explained by a low return to investment in these countries, and recent studies of FDI have increasingly turned attention towards country risk as an explanation for the poor investment records of African countries. Ideally, the appropriate risk measure would be the variance of returns, but since suitable measures of rates of return to FDI are rarely available, papers linking FDI to risk have rested on empirical proxies for country risk. While one group of studies includes various economic, political and commercial risk measures, another set of papers apply various volatility measures to proxy for risk. The most frequently applied volatility measure is the variance of GDP growth.

This paper provides a bridge between these two empirical methodologies. Taking the variance of GDP growth as the overall proxy for country risk, we argue that volatility should only be interpreted as risk when events are unpredictable. This paper suggests two refinements that take out the structural and systematic components of total risk thereby offering an improved measure of idiosyncratic country risk. This exercise allows us to decompose conditional risk (total risk adjusted for economic fundamentals) into its

Table 3: Determinants of Idiosyncratic Risk

	Economic	Political	Commercial	Combined	Combined
Risk measure	$\hat{\sigma}^2_{ui}$	$\hat{\sigma}^2_{ui}$	$\hat{\sigma}^2_{ui}$	$\hat{\sigma}^2_{ui}$	$\hat{\sigma}^2_{\Delta \ln(y_{it}),i}$
EXDEBT	0.388**				
	[0.153]				
DEBTSERV	-0.033***			-0.041*	-0.038***
	[0.012]			[0.013]	[0.014]
INTRES	1.233**				
	[0.560]				
CACCOUNT	-0.024**			-0.033***	-0.042***
	[0.012]			[0.001]	[0.007]
GCON		0.034***		0.027***	0.035***
		[0.012]		[0.001]	[0.007]
CIVIL		0.101**			
		[0.044]			
VDEMOC		0.037***			
		[0.019]			
ACCOUNT		-0.339***		-0.149***	
		[0.154]		[0.041]	
EXTERNAL				0.053***	
				[0.017]	
QUALITY			-0.267***		
			[0.075]		
PROFILE			-0.047***		
			[0.007]		
R^2	0.45	0.43	0.14	0.59	0.44

Note: Results from a general-to-specific analysis of 35 risk measures on idiosyncratic risk. The sample includes 60 developing countries. A constant was included but is not reported. Heteroscedastic consistent standard errors in brackets.*** significant at 1%, ** significant at 5%, * significant at 10%. The PcGets software package was used.

global, regional and idiosyncratic risk components. Results suggest that the low level of investment in African countries might be explained not only by a large conditional risk but more importantly by a large proportion of this risk being idiosyncratic risk.

As a final exercise, we utilise an econometric general-to-specific methodology to select robust indicators that describe the refined idiosyncratic country risk measure. We conclude that both economic and political risk variables are important determinants of idiosyncratic risk. Also, we find that the proposed commercial risk measures are not very successful in describing idiosyncratic risk and more work could be done in this area.

Overall, our results indicate that both empirical methodologies are valid in that our refined country risk measure correlate well with several of the risk proxies proposed in the literature. However, if the applied risk measure builds on the variance of GDP growth, it is important to adjust for structural and systematic risk components in order to capture idiosyncratic country risk. Likewise, if one chooses to include various risk measures particular attention should be directed towards the host country's ability to service its debt, to ensure a positive current account balance, to keep government consumption on a sustainable level, to implement democratic accountability and to avoid external conflicts.

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Chapter 3

A Mean-Variance Explanation of FDI Flows to Developing Countries

A Mean-Variance Explanation of FDI Flows to Developing Countries*

Eva Rytter Sunesen†
Department of Economics, University of Copenhagen

Abstract

An important feature of the world economy is the close global and regional integration due to strong trade and investment relations among countries. The high degree of integration between countries is likely to give rise to business cycle synchronisation in which case shocks will spillover from one country to another. This will have implications for the way investors evaluate the return and risk of investing abroad. This paper utilises a simple mean-variance optimisation framework where global and regional factors capture the interdependence between countries. The model implies that FDI is driven by the risk-adjusted rate of return as well as global and regional spillovers. The preditions of the model are confirmed in a sample of 60 countries over the period 1970-2000.

Keywords: Foreign direct investment, risk, portfolio, business cycles
JEL classifications: F21, G11, R11, E32

1 Introduction

While a large part of the empirical literature on FDI has focussed mainly on the traditional low-return explanation of limited FDI inflows to certain developing

*I am grateful for the valulable comments by Carl-Johan Dalgaard and Heino Bohn Nielsen.
†Department of Economics, University of Copenhagen. Studiestræde 6, 1455 Copenhagen K, Denmark. E-mail address: eva.rytter.sunesen@econ.ku.dk.

countries, more recent studies have attempted to control for the risk of investing abroad. The importance of risk stems from the fact that, in the face of the uncertainty connected to foreign investments, the objective of investors is to maximise the expected return on their investment in which case the variance of returns becomes a critical element in the locational choice of foreign investors. While empirical FDI analyses remain focused on deriving proxies for *local* return and risk, an important feature of the world economy is the close global and regional integration due to strong trade and investment relations among countries. The high degree of integration between countries is likely to give rise to business cycle synchronisation in which case shocks will spillover from one country to another. This will have implications for the way foreign investors evaluate return and risk.

This paper offers a theoretical framework for FDI that takes both return and risk into account, and where global and regional factors capture the interdependence between countries. This framework allows us to decompose total risk into covariance risk and idiosyncratic risk. *Covariance risk* is defined in Cochrane (2001, Ch. 7) as the variance in a country's return that is caused by common global and regional factors.[1] The global factor captures movements in the underlying forces that drive the economies, i.e. oil price shocks, productivity shocks and interest rate shocks. On the other hand, shocks that affect adjacent countries owing to similarities in production, export and trade structures would be captured by the regional factor. *Idiosyncratic risk*, on the other hand, is (unsystematic) country-specific risk and captures, among other things, changes in macroeconomic policy, internal conflicts or structural changes affecting return in a particular country.

Our theoretical model predicts that FDI flows are driven by the *risk-adjusted rate of return*. Moreover, once we take the interdependence between countries into account, care should be taken in defining both return and risk. First, return should include the spillovers from the global and regional investment climate due to business cycle synchronisation. Second, country risk should be adjusted for covariance risk in order to get a more precise measure of idiosyncratic risk since ignoring such

[1] Systematic risk and undiversifiable risk have both been used in the literature as synonyms for covariance risk. However, these terms rely on the existence of costless diversification opportunities and on the existence of a large market portfolio. The definition of covariance risk applied in this paper does not, and it continues to be relevant even when the investor invests only in a few countries and where there are certain entrance costs.

systematic comovements in returns exaggerates the measure of country risk.

We test the implications of our theoretical model on the net flow of FDI into a cross-section of 60 developing countries. We find that the strong relationship between FDI inflows and the risk adjusted rate of return can only be observed in the empirical model when a precise measure of idiosyncratic risk is obtained; that is once we control for both global and regional covariance risk. We also find that there is a relatively large and positive net effect from global integration. On the regional level, there is a positive net effect of being located in Asia and (to a lesser extent) in Africa. In Latin America, on the other hand, the regional return component is exactly balanced by the risk premium required to compensate for regional covariance risk, and there is thus no net effect of being located in this region. The results are robust to correcting for possible endogeneity problems.

The paper proceeds as follows. Section 2 summarises the theoretical arguments for global and regional business cycle synchronisation. Section 3 solves the investor's optimisation problem using a mean-variance optimisation framework under three different scenarios of interdependence between alternative FDI locations: no correlation (the traditional view), the presence of a global factor in a country's return (global business cycle) and, lastly, the coexistence of a global and regional component in returns (global and regional business cycles). Section 4 sets out the econometric modelling of the FDI relation and tests the implications of the theoretical model based on the risk measures derived in Sunesen (2006). Finally, Section 5 summarises and concludes.

2 Global and Regional Business Cycles

The phenomenon of globalisation, the close economic and financial integration of the world economy, is likely to give rise to comovements in economic aggregates and thus to business cycle effects. The leading explanation for business-cycle synchronisation is trade, which captures the flow of technological transmission and the extent to which a country is exposed to global shocks.[2]

[2]Another frequently referenced explanation is financial integration but in light of the poorly developed financial markets in most developing countries we focus on the trade mechanism. We refer to Baxter and Kouparitsas (2004) for further references on the many potential explanations

However, as pointed out by Frankel and Rose (1998) and Heathcote and Perri (2002), among others, one could also expect increased trade to result in increased sectoral specialisation (through returns to scale, etc.). If the primary business cycle shocks are sector-specific, then countries with greater similarity in sectoral structures and exports would tend to have more correlated business cycles, other things equal. This means that if adjacent countries have more similar industrial structures, export good compositions or initial endowments (human capital, physical capital, arable land, etc.) one might expect regional business cycle comovement.

Figure 1-3 in the Appendix suggest that there are regional similarities in the distribution of wealth (important to the income-generating process), in the composition of natural capital (suggestive of initial endowments) and in the distribution of economic activity (related to industrial structures) that might give rise to regional business cycle synchronisation due to asymmetric shocks to world prices - fluctuations in the prices of primary, capital and intermediate goods - and in the world real interest rate.[3]

Figure 1 shows the regional distribution of wealth divided into natural capital, produced capital and intangible capital. Wealth in African countries stems mainly from natural capital whereas intangible capital adds up to more than half of total wealth in Latin America and Asia. Figure 2 shows the composition of natural capital wealth. The non-renewable subsoil resources are particularly important in Latin America but weigh less heavily in Africa and Asia. Forested areas account for a large share of natural capital in Africa while dependency on land is strongest in Asia. Finally, Figure 3 depicts the distribution of economic activity. While more than a quarter of the income generated in Africa and Asia stems from agriculture, hunting, forestry and fishing, the number is only 15% in Latin America. Finally, while the three regions have comparable levels of economic activity in the mining, construction and transport sectors, the African manufacturing sector is largely underdeveloped compared with Latin America and Asia.

Together the data presented here suggest that we should expect both global and regional business cycle synchronisation. This is supported by a vast amount of

of business cycle comovement.

[3]Interest rate disturbances might cause significant business cycle fluctuations in highly indebted countries, the so-called HIPC countries, most of which are located in Sub-Saharan Africa and Latin America.

empirical evidence a few of which are summarised here. Kose, Otrok and Whiteman (2003) find that there is a distinct global business cycle that accounts for a large fraction of business-cycle variability in developed countries, whereas regional and idiosyncratic factors are more important in developing economies. The finding of a global business cycle is supported by Albuquerque, Loayza and Servén (2002), while Baxter and Kouparitsas (2004) and IMF (2005, Chapter 2) find evidence of regional business cycle comovement.

3 A Theoretical Model of Risk and Return

The presence of common global and regional factors in local returns means that there will be some systematic pattern in the covariance of returns that the investor can exploit in order to get a more precise measure of return and risk. The theoretical model builds on the mean-variance portfolio model associated particularly with Tobin (1958, 1965) and Markowitz (1952). The model assumes that multinational enterprises (MNEs) estimate the expected profitability of choices among risky assets by looking at the mean and variance provided by combinations of those assets.[4]

3.1 The Optimisation Problem

We make two simplifying assumptions that make the portfolio model suitable for the investment decision of MNEs. First, direct investors typically have a relatively long investment horizon, where the entry decision comes first and where the investor adjusts the size of his investment according to the expected profitability of investment in the particular country. Empirically, this means that FDI inflows in some periods might become negative, which will happen if dividend payments from the host country to the source country are higher than the investments made in that year. In financial terms this means that we allow for "short sales". This assumption also ensures that all countries are in the portfolio; some will be held

[4]This only leads to expected utility maximisation if investor's utility function depends only on the means and the variance of wealth (quadratic utility function) and if returns are normally distributed.

long (receive positive amounts of net FDI) and others will be held short (receive negative amounts of net FDI).

Second, we assume that there is riskless lending and borrowing. The majority of foreign investors are large-scale MNEs that come from industrialised countries with highly developed capital markets. Relative to investing in developing countries where the risk of investment is so much higher, assuming that the home market offers riskless lending and borrowing at the world interest rate is probably not a bad approximation.

Under the assumption of risk-less lending and borrowing, Sharpe (1963) finds that the optimal portfolio is the portfolio with the greatest ratio of excess return (expected return minus the risk-free rate) to standard deviation that satisfies that the sum of the proportions invested in the country equals 1. Substituting the constraint into the objective function means that we can solve the investor's optimisation problem by maximising the Sharpe Ratio (SR)

$$\max_{x} SR = \frac{\sum_{i=1}^{N} x_i(\bar{R}_i - R_f)}{[\sum_{i=1}^{N} x_i^2\sigma_i^2 + \sum_{i=1}^{N}\sum_{j=1,j\neq i}^{N} x_i x_j \sigma_{ij}]^{\frac{1}{2}}}, \tag{1}$$

where x_i is the share of FDI going to country i, $\bar{R}_i$ is the expected rate of return to investment in country i, R_f is the riskless rate of return (the world interest rate), σ_i^2 is the variance of return to investment in country i, and σ_{ij} is the covariance between returns in country i and country j. Setting the derivative with respect to x_m equal to zero and rearranging yields

$$\frac{dSR}{dx_m} = -[\lambda x_m \sigma_m^2 + \sum_{j=1,j\neq m}^{N} \lambda x_j \sigma_{mj})] + (\bar{R}_i - R_f) = 0, \tag{2}$$

where

$$\lambda = \frac{\sum_{i=1}^{N} x_i(\bar{R}_i - R_f)}{\sum_{i=1}^{N} x_i^2\sigma_i^2 + \sum_{i=1}^{N}\sum_{j=i}^{N} x_i x_j \sigma_{ij}} = \frac{\bar{R}_p - R_f}{\sigma^2(R_p)}, \tag{3}$$

and $\bar{R}_p$ is the expected return on the portfolio and $\sigma^2(R_p)$ is the variance of R_p. Defining $Z_m = \lambda x_m$ and substituting it for λx_m yields a system of N simultaneous equations for N unknown variables (Z_m):

$$\bar{R}_i - R_f = Z_m\sigma_m^2 + \sum_{j=1, j\neq m}^{N} Z_j\sigma_{mj}, \qquad m = 1, ..., N. \tag{4}$$

3.2 Adjusting for Global and Regional Interdependence

In an optimisation model of N countries the analyst must provide estimates of N expected returns, N variances of returns and $N(N-1)/2$ covariances of return. To simplify the problem, we utilise the empirical observation of global and regional interdependence summarised in the previous section to formulate index models that will provide a structural solution of the model.[5] We show here the derivations for the multi-index model since the single-index model follows directly. To our knowledge this paper is the first to offer an explicit solution of a multi-index model. In constructing the global and regional indices we make the identifying assumption that countries are small relative to the world (regional) economy, which implies that local factors may have a global (regional) component but that the reverse is not true.

The *multi-index model* assumes that country returns move together partly because of economy wide changes and partly because of countries belonging to regional subgroups. Let ω be an index of global market performance defined as $\omega = \alpha_\omega + \varepsilon_\omega$ where α_ω is the global rate of return and ε_ω captures global shocks. By symmetry, let τ_k be the index of regional market performance defined as $\tau_k = \alpha_{\tau_k} + \varepsilon_{\tau_k}$, where α_{τ_k} is the regional return and ε_{τ_k} captures regional shocks

[5] Index models have frequently been used to simplify the nature of interdependence between countries; see among others Rajan and Friedman (1997), Kose, Otrok and Whiteman (2003), and Albuquerque, Loayza and Servén (2002).

in region k, $k \in K$ where K is the set of regions. We can now define the rate of return to investment in country i as

$$R_i = \alpha_i + \beta_{i\omega}\omega + \sum_{k=1}^{K} \beta_{i\tau_k} I_{ik}\tau_k + u_i, \tag{5}$$

where α_i is the country-specific rate of return, and $\beta_{i\omega}$ is the degree of global integration, $\beta_{i\tau_k}$ is the degree of regional integration, and I_{ik} is an indicator of regional belonging that takes the value one if country i belongs to region k and zero otherwise. u_i captures idiosyncratic (country-specific) shocks.

While a multi-index model of this kind can be employed directly, the model would have some very convenient mathematical properties if the indexes were orthogonal, $E(\omega-\alpha_\omega)(\tau_k-\alpha_{\tau_k}) = E[\varepsilon_\omega \varepsilon_{\tau_k}] = 0$, and if the residual was uncorrelated with two indexes, $E[u_i(\omega-\alpha_\omega)] = E[u_i\varepsilon_\omega] = 0$ and $E[u_i(\tau_k-\alpha_{\tau_k})] = E[u_i\varepsilon_{\tau_k}] = 0$.[6] Under these assumptions total risk can be expressed as

$$\sigma_i^2 = \beta_{i\omega}^2\sigma_\omega^2 + \sum_{k=1}^{K} \beta_{i\tau_k}^2 I_{ik}\sigma_{\tau_k}^2 + \sigma_{u_i}^2, \tag{6}$$

where σ_ω^2 is the variance of global return, and $\sigma_{\tau_k}^2$ is the variance of return in region k. This formulation ensures that total risk can be decomposed into global and regional covariance risk, $\beta_{i\omega}^2\sigma_\omega^2$ and $\beta_{i\tau_k}^2\sigma_{\tau_k}^2$, as well as idiosyncratic risk, $\sigma_{u_i}^2$.

Substituting for $\sigma_i^2 = \beta_{i\omega}^2\sigma_\omega^2 + \sum_{k=1}^{K} \beta_{i\tau_k}^2 I_{ik}\sigma_{\tau_k}^2 + \sigma_{u_i}^2$ and $\sigma_{ij} = \beta_{i\omega}\beta_{j\omega}\sigma_\omega^2 + \sum_{k=1}^{K} \beta_{i\tau_k}\beta_{j\tau_k} I_{ik}I_{jk}\sigma_{\tau_k}^2$ in (4) and solving for x_i yields

$$x_i = \frac{1}{\lambda\sigma_{u_i}^2}[(\bar{R}_i - R_f) - \beta_{i\omega}C_\omega^* - \sum_{k=1}^{K} \beta_{i\tau_k} I_{ik} C_{\tau_k}^*], \tag{7}$$

where $C_\omega^* = \sigma_\omega^2 \sum_{j=1}^{N} Z_j\beta_{j\omega}$ and $C_{\tau_k}^* = \sum_{j=1}^{N} Z_j\beta_{j\tau_k}\sigma_{\tau_k}^2$.[7]

[6] In the Cohen and Pogue (1967) notation, this means that we apply the multi-index model in its diagonal form.

[7] λ is the risk-adjusted excess return on the portfolio. Since it is the same for all the countries in the portfolio, it will be ignored in the remaining part of the paper.

3.3 Implications

Scenario 1. If there is no correlation between countries ($\beta_{i\omega} = \beta_{i\tau_k} = 0, \forall\, k \in K$), the share of FDI going to country i, x_i, will be given by

$$x_i = \frac{1}{\sigma^2_{\varepsilon_i}}[\bar{R}_i - R_f].$$

The term $\bar{R}_i - R_f$ reflects the excess return over the risk-free rate of return, and it can therefore be interpreted as the risk premium imposed on country i. Since our empirical analysis will be based on a cross-section of countries we can set the risk-free rate equal to zero without loss of generality. We can then simplify the expression

$$x_i = \frac{1}{\sigma^2_{\varepsilon_i}}\bar{R}_i = \frac{\alpha_i}{\sigma^2_{\varepsilon_i}}, \tag{8}$$

where α_i is the expected rate of return to investment in country i, and $\sigma^2_{\varepsilon_i}$ is the total risk of investing in country i ($\sigma^2_{\varepsilon_i} = \sigma^2_i$). In effect, this implies that all FDI should flow to the country with the highest risk-adjusted rate of return. This approach is clearly too simplistic and such a corner solution never manifests itself.

Scenario 2. In the presence of a common movement in returns due to a global business cycle ($\beta_{i\tau_k} = 0\ \forall,\ k \in K$), the single index model gives

$$x_i = \frac{1}{\sigma^2_{e_i}}[\bar{R}_i - R_f - \beta_{i\omega}C^*_\omega].$$

For a country to be held long, $x_i > 0$, we must require that $C^*_\omega < (\bar{R}_i - R_f)/\beta_{i\omega}$. $(\bar{R}_i - R_f)/\beta_{i\omega}$ is the standardised global risk premium; i.e. the risk premium relative to country i's contribution to global covariance risk (also called excess return to beta). We can therefore interpret C^*_ω as the global cut-off point: only countries with a standardised global risk premium beyond the global cutt-off point will receive positive amounts of FDI. Again, we can rewrite the expression to get a more intuitive interpretation:

$$x_i = \frac{\alpha_i}{\sigma^2_{e_i}} + (\alpha_\omega - C^*_\omega)\frac{\beta_{i\omega}}{\sigma^2_{e_i}}, \tag{9}$$

where α_ω is the global return, $\sigma^2_{e_i}$ is the risk of investing in country i adjusted for global covariance risk ($\sigma^2_{e_i} = \sigma^2_i - \beta^2_{i\omega}\sigma^2_\omega$), and $\beta_{i\omega}$ is the degree of global spillovers. The first term is the risk-adjusted rate of return familiar from Scenario 1. The second term reflects the country-specific net effect of global integration, which will depend on the combined sign of $(\alpha_\omega - C^*_\omega)$ and $\beta_{i\omega}$. If the global return is higher than the global cut-off point, $\alpha_\omega > C^*_\omega$, there is a net benefit of global integration and the country therefore gains from being positively correlated with the global business cycle, $\beta_{i\omega} > 0$.

Since the portfolio includes both countries that are positively and negatively correlated with the world economy the investor gains from diversifying across countries. However, since countries are not perfectly correlated and since there is a finite number of developing countries (each MNE is typically only present in a small number of countries) investors cannot diversify away all covariance risk.

Scenario 3. In the presence of both global and regional business cycle effects, the relevant regression is

$$x_i = \frac{\alpha_i}{\sigma^2_{u_i}} + (\alpha_\omega - C^*_\omega)\frac{\beta_{i\omega}}{\sigma^2_{u_i}} + \sum_{k=1}^{K}(\alpha_{\tau_k} - C^*_{\tau_k})I_{ik}\frac{\beta_{i\tau_k}}{\sigma^2_{u_i}}, \tag{10}$$

where $\beta_{i\tau_k}$ is the degree of regional spillovers, $C^*_{\tau_k}$ is the regional risk premium, and $\sigma^2_{u_i}$ is total risk adjusted for both global and regional risk components ($\sigma^2_{u_i} = \sigma^2_i - \beta^2_{i\omega}\sigma^2_\omega - \sum_{k=1}^{K}\beta^2_{i\tau_k}I_{ik}\sigma^2_{\tau_k}$). By symmetry, if the regional return outweighs the regional covariance risk ($\alpha_{i\tau_k} - C^*_{\tau_k} > 0$), a country that is positively correlated with the regional business cycle will benefit from its regional location.

The investor now experiences a second diversification gain by investing in countries that are positively as well as negatively correlated with the regional economy. Since the regional return components are assumed to be uncorrelated once we control for the common comovement due to the global business cycle, there is no additional diversification benefit from diversifying across regions.

4 Empirical Estimation

In this section we take the structural model of FDI to the data. To estimate the model we need proxies for local returns, global and regional spill-overs as well as

various risk measures. In the most elaborated case where countries are affected both by global and regional spillovers, equation (5) decomposes return according to

$$R_{it} = \alpha_{it} + \beta_{i\omega}\omega_t + \sum_{k=1}^{K} \beta_{i\tau_k} I_{ik}\tau_{kt} + u_{it}.$$

Since direct measures of the return to FDI in developing countries are not available, we follow the methodology in Sunesen (2006) to obtain the country-specific return (α_{it}), the global and regional rates of return (ω_t and τ_{kt}), and the degrees of global and regional integration ($\beta_{i\omega}$ and $\beta_{i\tau_k}$). The main steps of the procedure are shortly schetched here.

First, we proxy return by growth in GDP per capita, g_{it}, and apply annual data for a sample of 126 developed and developing countries to estimate

$$g_{it} = x'_{it}\delta + \varepsilon_{it}, \qquad \varepsilon_{it} \sim IID(0, \sigma^2_{\varepsilon_i}) \tag{11}$$

where x_{it} is a vector of slowly-moving growth determinants and ε_{it} is the growth residual. The country-specific return, α_i, can then be proxied by averaging $x'_{it}\hat{\delta}$ over time, and $\sigma^2_{\varepsilon_i}$ is interpreted as conditional risk (total risk adjusted for economic fundamentals). To take out the global return component we decompose further

$$\hat{\varepsilon}_{it} = \beta_{i\omega}\omega_t + e_{it}, \qquad e_{it} \sim IID(0, \sigma^2_{e_i}) \tag{12}$$

where $\hat{\omega}_t$ can be identified as the first principal component from a principal components analysis (PCA) of $\hat{\varepsilon}_{it}$, and $\beta_{i\omega}$ is the factor loading. $\sigma^2_{e_i}$ is conditional risk adjusted for global covariance risk. Averaging ω_t over time gives the global return component, ω. By symmetry, we adjust for regional spillovers by undertaking a PCA of $\hat{e}_{it}$ for each region individually and estimate

$$\hat{e}_{it} = \sum_{k=1}^{K} \beta_{i\tau_k} I_{ik}\tau_{kt} + u_{it}, \qquad u_{it} \sim IID(0, \sigma^2_{u_i}) \tag{13}$$

where τ_{kt} is the first principal component and $\beta_{i\tau_k}$ is the factor loading from the PCA of region k.

The great advantage of undertaking the PCA in two steps is the precise in-

terpretation and identification of the principal components as capturing global and regional spillovers. In addition, the methodology ensures that the crucial assumptions of the multi-index model are satisfied: the covariance between the two indexes is zero, the residual is uncorrelated with each index, and the covariance between the residual i and the two indexes is zero.

4.1 Results

We now turn to the regression analysis and we estimate the three cross-section equations using Ordinary Least Square (OLS) for the sample of 60 countries[8]

$$\textbf{Scenario 1.} \quad x_i = c_0 \frac{\hat{\alpha}_i}{\hat{\sigma}^2_{\varepsilon_i}} + \varepsilon_i$$

$$\textbf{Scenario 2.} \quad x_i = c_0 \frac{\hat{\alpha}_i}{\hat{\sigma}^2_{e_i}} + c_1 \frac{\hat{\beta}_{i\omega}}{\hat{\sigma}^2_{e_i}} + e_i$$

$$\textbf{Scenario 3.} \quad x_i = c_0 \frac{\hat{\alpha}_i}{\hat{\sigma}^2_{u_i}} + c_1 \frac{\hat{\beta}_{i\omega}}{\hat{\sigma}^2_{u_i}} + c_2 AFR \frac{\hat{\beta}_{i\tau_{AFR}}}{\hat{\sigma}^2_{u_i}} + c_3 ASIA \frac{\hat{\beta}_{i\tau_{ASIA}}}{\hat{\sigma}^2_{u_i}} + c_4 LAC \frac{\hat{\beta}_{i\tau_{LAC}}}{\hat{\sigma}^2_{u_i}} + u_i$$

While c_0 reflects the importance of the risk-adjusted rate of return (where the definition of risk varies between the three scenarios), c_1 reflects the net benefit of global integration ($\alpha_\omega - C^*_\omega$), and c_2 to c_4 reflect the net benefit of regional belonging ($\alpha_{\tau_k} - C^*_{\tau_k}$, where $k = AFR,\ ASIA,\ LAC$). Results using standard errors adjusted for cluster-correlations are reported in Table 1.

The first column shows the regression results based on the traditional view that FDI inflows are driven by returns, α_i, and that countries are completely independent. Country returns enter positively but insignificant and the explanatory power is very low. In Scenario 1, countries are completely independent and the

[8] As in the majority of empirical FDI studies, China has been excluded from the sample due to its dominant share of FDI into developing countries and Asia in particular. Not only has this status been achieved in a relatively short period of time, see UNCTAD (1994), but concerns have also been raised about the reported magnitude of FDI inflows into China. The World Bank (1996) reports that the overestimation may be more than 25% of annual FDI flows. In addition, Brazil and Mexico are huge FDI recipients compared with other Latin American countries, and their outlier status is confirmed by the test for multiple outliers in multivariate data in Hadi (1992, 1994).

Table 1: FDI Regressions (OLS estimation)

	Traditional	Scenario 1	Scenario 2	Scenario 3
Return	2.89	0.027	0.027	0.020**
	[13]	[0.03]	[0.02]	[0.008]
Global integration			0.11**	0.098**
			[0.05]	[0.04]
Asian integration				0.057***
				[0.007]
Latin American integration				-0.024
				[0.02]
African integration				0.020*
				[0.01]
Constant	0.60***	0.57***	0.42***	0.34***
	[0.1]	[0.1]	[0.1]	[0.1]
R-squared	0	0.07	0.18	0.51

Note: OLS regression including 60 countries (excluding China, Brazil and Mexico). The dependent variable is average net FDI inflows from 1970-2000. Heteroscedastic consistent standard errors adjusted for cluster-correlations are in brackets. *** p<0.01, ** p<0.05, * p<0.1

only determinant of FDI is the risk-adjusted rate of return. This variable turns out to be positive and insignificant and the explanatory power remains very low. In Scenario 2 we adjust for global interdependence and we find that there is a positive net benefit of global integration

In Scenario 3 we see that the more precise definition of idiosyncratic risk once we adjust for global and regional covariance risk means that the risk-adjusted rate of return is clearly identified and significant. In addition to a positive net benefit of global integration, we find that there is a strong positive net gain of being located in Asia whereas the African spillover effect is lower and less significant. The Latin American return factor, on the other hand, is exactly matched by the risk premium required to compensate for regional covariance risk.

4.2 Endogeneity Problems

The methodology in Sunesen (2006) is based on the premise that GDP growth is closely related to the return to investment and thus that growth is a main driver of FDI. However, one needs to face the question of causality since FDI has the potential to transfer knowledge and technology that might spur growth. If this is the case, all variables in the regression are potentially endogenous since they

are based either on predicted growth or on the growth residual. Although Hansen and Rand (2004) present empirical evidence of a bidirectional relationship between FDI and growth in the short run only and support for a causal link from growth to FDI in the long run, we wish to make sure that our results are robust against possible endogeneity problems.

We therefore use the two-stage least square (2SLS) estimator based on a set of instruments that we expect to be highly correlated with the explanatory variables but uncorrelated with the error term. The set of instruments include: the Fearon (2003) ethnic fractionalisation index, the land area in square kilometers from the World Development Indicator (2005), the 1966 malaria index from Gallup and Sachs (1999), the Alesina et al. (2003) linguistic fractionalisation index, the dummy for landlockness from Gallup and Sachs (1999), the Barro and Lee (1994) war dummy and the proportion of a country's land area within 100 km of the ocean from Gallup and Sachs (1999). Data availability means that we end up with a sample of 56 developing countries. Results are reported in Table 2.

The Sargan Hansen test of weak instruments indicates that our instruments are valid, and the Anderson canonical correlation test and the Cragg Donald F-test confirm that we have no problem with weak instruments. The Anderson-Rubin test shows that explanatory variables are jointly significant in the regressions. However, the Durbin-Wu-Hausman test confirms the Hansen and Rand (2004) finding that growth drives FDI and not the opposite. Hence, we can treat all variables as exogenous in the regression and rely on the results in Table 1.

5 Summary and Conclusions

This paper applies a simplified version of the mean-variance portfolio model that explicitly takes the interdependence of alternative investment locations into account. The model predicts that FDI inflows are driven by the *risk-adjusted rate of return* but that one should be very careful in the applied definition of both return and risk. First, return should include the spillovers from the global and regional investment climate due to business cycle synchronisation. Second, country risk should be adjusted for covariance risk in order to get a more precise measure of idiosyncratic risk since ignoring such systematic comovements in returns exagger-

Table 2: FDI Regressions (2SLS estimation)

	Scenario 1	Scenario 2	Scenario 3
Return	0.041	0.046**	0.019**
	[0.03]	[0.02]	[0.01]
Global integration		0.24***	0.19***
		[0.08]	[0.07]
Asian integration			0.050***
			[0.02]
Latin American integration			-0.065*
			[0.04]
African integration			0.023
			[0.04]
Constant	0.58***	0.28**	0.33**
	[0.1]	[0.1]	[0.1]
Number of countries	56	56	56
R-squared	0.04	0.05	0.45
Test statistics (p-values)			
Sargan test of overidentification	0.12	0.083	0.35
Anderson test of weak instruments	0.0000	0.0000	0.0017
Cragg Donald test of underidentification	0.0000	0.0000	0.0006
Anderson-Rubin test of joint significance	0.0000	0.0000	0.000
Durbin-Wu-Hausman test of endogeneity	1.00	0.62	0.59
First stage F-statistics			
Return	48.61	42.38	25.38
Global integration		37.23	55.35
Asian integration			10.69
Latin American integration			18.59
African integration			29.88
Joint significance		12.91	12.25

Note: 2SLS regression where all variables are instrumented by ethnic fractionalisation, land area, the malaria index, linguistic fractionalisation, landlockness, war dummy and the proportion of land close to the ocean. The dependent variable is average net FDI inflows from 1970-2000. Heteroscedastic consistent standard errors adjusted for cluster-correlations are in brackets. *** p<0.01, ** p<0.05, * p<0.1

ates the measure of country risk. In the most extended model, we find that the investor diversifies his portfolio in two ways: by investing in countries that are positively as well as negatively correlated with the global business cycle, and by investing in countries that are positively as well as negatively correlated with the regional economy.

We test the implications of our theoretical model on the net flow of FDI into 60 developing countries. We find that FDI inflows are determined by the risk-adjusted rate of return once we adjust for global and regional covariance risk, and that there is a positive net benefit of global integration. Also, we find that there is a strong positive net gain of being located in Asia whereas the African spillover effect is lower and less significant. The Latin American return factor, on the other hand, is exactly matched by the risk premium required to compensate for regional covariance risk.

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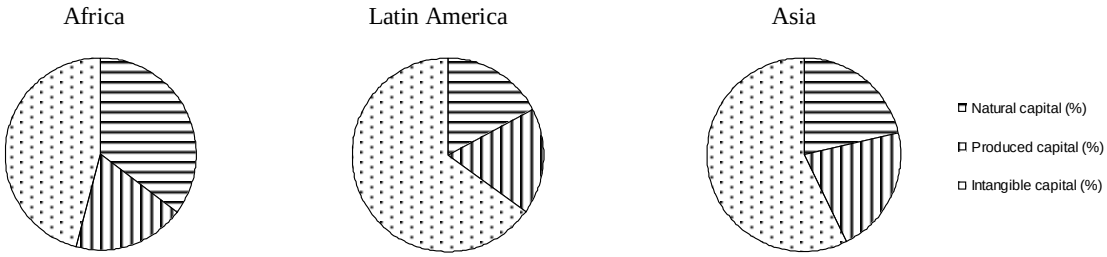
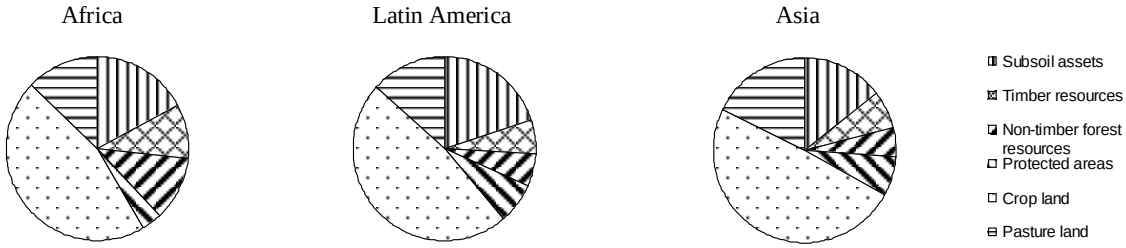
Appendix

Figure 1. Distribution of Wealth



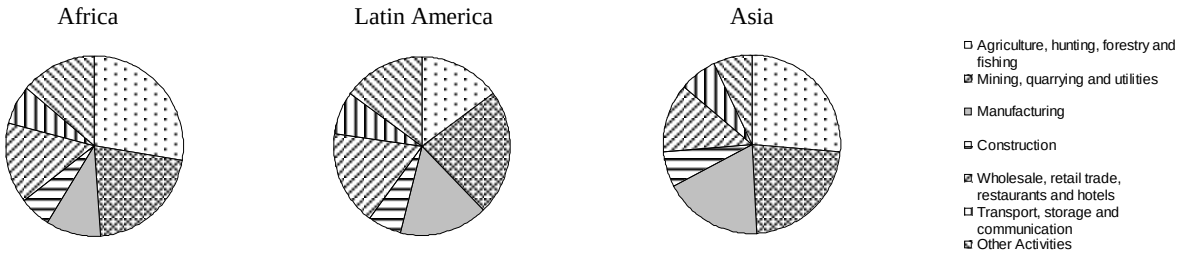
Source: World Bank (2005). Data is in per cent of total wealth. Natural capital is the sum of non-renewable subsoil resources, forested areas and land areas. Produced capital is the sum of equipment and machinery, structures and urban land. Intangible capital is calculated as the residual wealth and includes mainly human capital, institutional quality and social capital.

Figure 2. Composition of Natural Capital Wealth



Source: World Bank (2005). Data is in per cent of total wealth. Subsoil assets include oil, natural gas, coal and mineral resources.

Figure 3. Distribution of Economic Activity



Source: Data is from the National Accounts Main Aggregates Database. Data is in per cent of natural capital wealth.

Chapter 4
Does Aid Increase Foreign Direct Investment?

Does Foreign Aid Increase Foreign Direct Investment?*

Pablo Selaya[†] *and Eva Rytter Sunesen*[‡]
Department of Economics, University of Copenhagen

Abstract

The notion that foreign aid and foreign direct investment (FDI) are complementary sources of capital is conventional among governments and international cooperation agencies. This paper argues that the notion is incomplete. Within the framework of an open economy Solow model we show that the theoretical relationship between foreign aid and FDI is indeterminate. Aid may raise the marginal productivity of capital by financing complementary inputs, such as public infrastructure projects and human capital investment. However, aid may also crowd out productive private investments if it comes in the shape of physical capital transfers. We therefore turn to an empirical analysis of the relationship between FDI and disaggregated aid flows. Our results strongly support the hypotheses that aid invested in complementary inputs draws in foreign capital while aid invested in physical capital crowds out FDI. The combined effect of these two types of aid is small but on average positive.

Keywords: Foreign aid, foreign direct investment, open economy Solow model
JEL classifications: F21, F35, H40, O19

1 Introduction

A salient point in the UN (2002) Monterrey Report of the International Conference on Financing for Development is that official development assistance (ODA), trade and foreign direct investment (FDI) are three essential tools for development financing. In particular:

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[†]Department of Economics, University of Copenhagen. Studiestræde 6, 1455 Copenhagen K, Denmark. E-mail address: pablo.selaya@econ.ku.dk.

[‡]Department of Economics, University of Copenhagen. Studiestræde 6, 1455 Copenhagen K, Denmark. E-mail address: eva.rytter.sunesen@econ.ku.dk.

> "ODA plays an essential role as a complement to other sources of financing for development, especially in those countries with the least capacity to attract private direct investment. A central challenge, therefore, is to create the necessary domestic and international conditions to facilitate direct investment flows, conducive to achieving national development priorities, to developing countries, particularly Africa, least developed countries, small island developing States, and landlocked developing countries, and also to countries with economies in transition." (UN, 2002, p. 9).

However, the implicit presumption that ODA has a "catalysing" effect on FDI, i.e., that aid and FDI are complements, is by no means evident. Kosack and Tobin (2006) argue that aid and FDI are unrelated, because aid is mainly oriented to support the government budget and finance investments in human capital, while FDI is a private sector decision and relatively more connected to physical capital. Caselli and Feyrer (2007) find that the marginal product of capital (MPK) is roughly the same across countries, and one of the implications is that increasing aid inflows to developing countries will lower the MPK in these economies and will tend to be fully offset by outflows of other types of capital investments (p. 540). If this is the case, aid and FDI are clearly closer to being substitutes rather than being complements.

This paper provides a unified framework for assessing the relative merit of these different claims. We set up an open-economy Solow model with perfect capital mobility that distinguishes between aid directed towards complementary factors of production and aid invested in physical capital. The distinction serves to illustrate, on the one hand, that aid invested in complementary factors increases MPK in the recipient country, which tends to draw in additional foreign resources, and thus helps to sustain a higher level of capital over time. For example, aid can ease important bottlenecks in poor countries by financing public infrastructure and human capital investments that would not have been undertaken by private actors (due to the free-riding problem in financing public goods), nor by public agents (because of the budgetary constraints that prevent aid-recipient governments from undertaking this type of investments). On the other hand, the model also shows that foreign aid invested in physical capital directly competes with other types of capital, and thus replaces investments that private actors would have undertaken anyway. In this case, capital mobility and rate-of-return equalisation across countries will give rise to a flight of other types of capital after an aid flow has been received.

The theoretical model provides a number of results and testable predictions. First, for a given level of domestic saving, aid invested in physical capital crowds out other types of foreign investments in physical capital, one for one. Second, aid invested in complementary factors of production has an ambiguous effect on FDI. The logic of the ambiguity is that, while an increase in complementary factors increases MPK, the productivity increase also raises income, domestic savings and domestic investments, which tends to lower MPK

and thus to crowd out foreign investments. These two findings suggest that the overall impact of aid on FDI is ambiguous and that the composition of aid matters. Finally, the relationship between complementary aid and FDI is unlikely to be linear, so scale effects from this type of aid should be taken into account.

We take the implications of our theoretical model to the data utilising a panel of 84 countries over the period 1970-2001. We find a large and positive effect of aid invested in complementary factors, while aid invested in physical capital has a negative impact on FDI. Although the combined impact of these two types of aid on FDI remains positive, our results imply that more aid should be directed towards inputs complementary to physical capital to optimise the return on aid. The results are robust to (1) a broader definition of complementary aid than that adopted in our benchmark estimations, (2) to allowing for imperfect capital mobility, and (3) to including other traditional FDI determinants.

The paper is structured as follows. Section 2 reviews the scarce empirical literature on FDI and aid. Section 3 introduces the theoretical model of FDI and aid building on an open economy Solow model with perfect capital mobility. Section 4 discusses relevant econometric issues and presents the data. Section 5 shows the results, and Section 6 tests their robustness. Section 7 sums up and discusses policy implications.

2 Literature Review

The relationship between aid and FDI is controversial and empirical results remain inconclusive. To our knowledge, only four papers explicitly analyse the relationship between aid and FDI. Harms and Lutz (2006) and Karakaplan *et al.* (2005) analyse the question for a broad sample of developing countries. Karakaplan *et al.* (2005) find that aid has a negative direct effect on FDI and that both good governance and financial market development significantly improve the impact of aid on subsequent flows of FDI. Harms and Lutz (2006), on the other hand, find that once they control for the regulatory burden in the host country, aid works as a complement to FDI and, surprisingly, that the catalysing effect of foreign aid is stronger in countries that are characterised by an unfavourable institutional environment.

The two case studies based on Japanese FDI and aid flows in Kimura and Todo (2007) and Blaise (2005) also find incongruent results. While Blaise (2005) finds positive effects of aid to infrastructure projects, Kimura and Todo (2007) find no positive infrastructure effect, no negative rent-seeking effect but a positive vanguard effect (arising when foreign aid from a particular donor country promotes FDI from the same country but not from other countries).

This paper argues that the mixed results can be explained by the high level of aggregation of the aid variable. While Karakaplan *et al.* (2005) include only overall ODA, Harms and Lutz (2006) also distinguish between grants, technical cooperation grants, as

well as bilateral and multilateral aid. However, it remains unclear why one would expect foreign investors to react differently to these sources of aid. Kimura and Todo (2007) apply the idea of different types of aid, but construct their proxies relying only on data for aid commitments and they only separate out aid to physical infrastructure.

3 A Theoretical Model of FDI and Aid

A general shortcoming in the empirical literature is the lack of consensus on the specification of the FDI relation, and none of the existing empirical papers on aid and FDI are supported by a theoretical model. This paper closes this gap by proposing a Solow model for a small open economy to model the main characteristics of the relationship between aid and FDI.[1]

We assume a Cobb-Douglas production function where GDP per capita, y, is given by

$$y = Ak^{\alpha}, \tag{1}$$

where k is the stock of physical capital per capita, $\frac{K}{L}$, α is a constant and A denotes total factor productivity.

We assume that the total flow of foreign aid, AID, can be split into aid invested in complementary factors, AID_A, and aid invested in physical capital, AID_K, where $AID = AID_A + AID_K$. AID_A by nature raises the marginal productivity of all production factors that are complementary to physical capital.[2] For example, infrastructure investments lead to the interconnection of markets (Easterly and Levine, 1999), while investments in human capital improve technology adoption. AID_K, on the other hand, enters the production function only through its effect on physical capital accumulation, and has no (augmenting) effect on total factor productivity.[3]

To model this explicitly, we first assume that complementary aid has an augmenting effect on all production factors that are complementary to physical capital, and we thus allow the flow of AID_A to increase the existing stock (A_0) of A in the economy:

$$A = A_0 + AID_A. \tag{2}$$

Allowing complementary aid to have a direct impact on A is a shorthand for the idea that AID_A has an augmenting effect on any production factor other than k (e.g. human capital,

[1] One exception is Beladi and Oladi (2007) who analyse the question in a general equilibrium setting where all foreign aid is used to finance public goods.

[2] The argument of complementarity between public and private investment is generalised by Clarida (1993) and Chatterjee et al. (2003). Reinikka and Svensson (2002) find empirical support for the importance of complementary public capital for foreign investors.

[3] We thus allow part of foreign aid to be productivity enhancing while FDI brings no spillovers. In reality, all capital transfers might contain some knowledge transfer but the assumption is made to keep the model simple and tractable.

public investments, new technology, etc.) and, thus, it is able to increase –ultimately– the MPK.

Second, we assume an open economy.[4] Accordingly, in per capita terms, capital equipment can be financed by (i) domestic savings ($S = sy$, where s is a given savings rate), (ii) foreign direct investments (fdi) and (iii) the inflow of aid invested in physical capital (aid_K). Then capital accumulation per capita is given by

$$\dot{k} = sy + fdi + aid_K - (n + \delta)k, \tag{3}$$

where n is the population growth rate and δ is a fixed depreciation rate.

With perfect capital mobility, the world real rate of return, r^w, pins down at any point in time the net return to capital (MPK $- \delta$), and thus

$$r^w = \text{MPK} - \delta = A\alpha k^{\alpha-1} - \delta. \tag{4}$$

According to (4), the steady state level of k at any point in time is given by

$$k^* = \left[\frac{A\alpha}{r}\right]^{\frac{1}{1-\alpha}}, \tag{5}$$

where r is defined as a gross world real rate of return, $r^w + \delta$.

Rewriting (3) taking (5) as given, the flow of FDI per capita is determined as the residual

$$fdi = -aid_K - sy^* + (n + \delta)k^*, \tag{6}$$

where $y^* = Ak^{*\alpha}$.

At a first glance, (6) seems to support the Caselli and Feyrer (2007) conjecture that aid and FDI are substitutes: for a given level of domestic savings, equalisation between MPK and r requires an increase in foreign aid to be accommodated by a proportional reduction in FDI:

$$\frac{\partial fdi}{\partial aid_K} = -1. \tag{7}$$

However, this finding only holds for aid invested in physical capital. The effect of complementary aid, on the other hand, has two components:

$$\frac{\partial fdi}{\partial aid_A} = -s\frac{\partial y^*}{\partial aid_A} + (n + \delta)\frac{\partial k^*}{\partial aid_A}. \tag{8}$$

First, since

$$s\frac{\partial y^*}{\partial aid_A} = s\frac{\partial \left(Ak^{*\alpha}\right)}{\partial aid_A} = s\left[Lk^{*\alpha} + A\alpha k^{*\alpha-1}\frac{\partial k^*}{\partial aid_A}\right] > 0, \tag{9}$$

[4] In line with Sørensen and Witta-Jacobsen (2006, Ch. 4) and Turnovsky (2000).

complementary aid has a positive effect on domestic savings and thus on domestically financed capital investments. This result comes from the fact that aid_A shifts the production function thereby raising the steady state levels of income and domestic savings. Given the assumption of MPK equalisation in (4), the corresponding increase in domestically financed investments causes a proportional reduction in the need for FDI of the size $-s\frac{\partial y^*}{\partial aid_A}$.

Also, since

$$\frac{\partial k^*}{\partial aid_A} = \frac{\partial}{\partial aid_A}\left(\left[\frac{A\alpha}{r}\right]^{\frac{1}{1-\alpha}}\right) = \frac{1}{1-\alpha}\left[\frac{A\alpha}{r}\right]^{\frac{\alpha}{1-\alpha}}\frac{L\alpha}{r} > 0, \tag{10}$$

we see that complementary aid has a positive effect on the steady state capital stock. This finding is based on the augmenting effect of aid_A, which raises MPK and thus allows the recipient country to increase its capital stock without experiencing a counterbalancing capital flight. That is, for a fixed s, aid-financed investments in complementary factors allow a sustainable increase in FDI equal to $(n+\delta)\frac{\partial k^*}{\partial aid_A}$.

This model holds then several implications that should be taken into account when assessing the empirical relationship between aid and FDI. First, the effect of total aid on FDI is ambiguous:

$$\frac{\partial fdi}{\partial aid} = \frac{\partial fdi}{\partial aid_K} + \frac{\partial fdi}{\partial aid_A} = -1 - s\frac{\partial y^*}{\partial aid_A} + (n+\delta)\frac{\partial k^*}{\partial aid_A} \gtrless 0, \tag{11}$$

because we expect aid to production sectors to have a negative effect on FDI, but the effect of complementary aid is indeterminate. Second, from equations (9) and (10), since the marginal effect of complementary aid on FDI includes the level of aid itself, the relationship between complementary aid and FDI is not linear. In particular, there are scale effects from complementary aid that should be taken into account. Since $-s\frac{\partial y^*}{\partial aid_A}$ and $(n+\delta)\frac{\partial k^*}{\partial aid_A}$ work in opposite directions, the sign of the second order effects will also be indeterminate and will need to be assessed empirically. Third, the model stresses the need to take all sources of capital into account, and it is therefore essential to include domestic savings as an additional explanatory variable in the empirical FDI analysis. To our knowledge, this has not been done before.

4 Econometric Issues

In a panel setting, the econometric interpretation of the aid-FDI relationship is

$$fdi_{it} = \beta_0 + \beta_1 A^0_{it} + \beta_2 n_{it} + \beta_3 S_{it} + \beta_4 aid^K_{it} + \beta_5 aid^A_{it} + \beta_6 \left(aid^A_{it}\right)^2 + u_{it}, \tag{12}$$

where fdi_{it} is FDI per capita in country i during period t, A^0_{it} is the overall productivity level at the beginning of period t, n_{it} is population growth, S_{it} is domestic savings per capita, aid^K_{it} is aid invested in physical capital, and aid^A_{it} is aid invested in complementary factors. The square of aid^A_{it} is included in (12) to control for the scale effects of complementary aid.

We expect β_1 to be positive since a high productivity level gives a high steady state level of capital, β_2 should be positive since a fast growing population lowers the per capita capital stock and thus allows for an increase in FDI per capita, and β_3 should be negative since high domestic saving lowers the need for foreign capital. From equation (7) we know that aid_K crowds out foreign investments one-to-one, $\beta_4 = -1$, whereas the effect of aid_A (β_5 and β_6) is indeterminate. Since data on total productivity is unavailable, the next section will discuss the strategy used to identify A^0_{it} empirically.

4.1 Productivity

Since data on the initial productivity level (A^0_{it}) is unavailable, we need to find valid proxies. In the first case, we use pooled OLS (POLS) and estimate

$$fdi_{it} = \alpha_t + \beta_0 + \beta_1 n_{it} + \beta_2 S_{it} + \beta_3 aid^K_{it} + \beta_4 aid^A_{it} + \beta_5 \left(aid^A_{it}\right)^2 + u_{it}, \qquad (13)$$

where α_t is a time-specific constant that captures common productivity shocks at time t. However, not all countries start out with the same initial conditions and we thus allow also for cross sectional differences in productivity by including time-invariant country-specific fixed effects, α_i,

$$fdi_{it} = \alpha_t + \alpha_i + \beta_0 + \beta_1 n_{it} + \beta_2 S_{it} + \beta_3 aid^K_{it} + \beta_4 aid^A_{it} + \beta_5 \left(aid^A_{it}\right)^2 + u_{it}. \qquad (14)$$

This equation can be estimated consistently and efficiently with a fixed effects model (FE). However, if productivity evolves unequally across countries over time, regression (14) leaves out important information. We therefore extend the list of variables to include a lagged dependent variable, which captures time-moving country-specific factors as well as agglomeration effects,

$$fdi_{it} = \alpha_t + \alpha_i + \beta_0 + \beta_1 fdi_{it-1} + \beta_2 n_{it} + \beta_3 S_{it} + \beta_4 aid^K_{it} + \beta_5 aid^A_{it} + \beta_6 \left(aid^A_{it}\right)^2 + u_{it}. \qquad (15)$$

Equation (15) can be estimated consistently and efficiently using the Arellano and Bond (1991) Generalised Method of Moments (GMM) estimator. It is important to notice that including a lagged dependent variable also reduces the need to control for other FDI determinants. All estimators use standard errors that are robust to arbitrary heteroskedasticity as well as intra-group correlation (clustering).

4.2 Endogeneity

We need to consider the possible endogeneity of aid in estimating the above equations, since all estimators are consistent only if all explanatory variables are exogenous. Aid would be endogenous, for example, if donors systematically disburse more resources to those countries that are neglected by private foreign investors (Harms and Lutz, 2006). We therefore estimate (13)–(15) following the instrumentation strategy in Hansen and Tarp (2000, 2001), Dalgaard and Hansen (2001) and Dalgaard *et al.* (2004).

The first set of instruments accounts for donors' overall preference for granting more aid to countries with smaller populations and lower levels of income per capita and thus includes (lagged) interactions between levels of aid and (i) the size of population and (ii) the initial level of GDP per capita in the recipient country. We also include the lagged level of aid to account for persistency in other determinants of aid as well as a dummy variable for African countries in the CFA franc zone to capture particular donors' strategic interests.

Tests confirm the validity of our instruments, and the Durbin-Wu-Hausman test finds that the aid variables should be treated as endogenous in the FDI relation. All the results reported in the next section are therefore based on Instrumental Variables (IV) methods.

4.3 Data

The dependent variable, fdi_{it}, is net FDI inflows in constant US dollars from the UNCTAD Foreign Direct Investment database, divided by the population to control for country size. The main explanatory variables are the population growth rate and savings per capita from the WDI (2005).

The aid variables are based on total net flows of official aid disbursements reported in the OECD/DAC database. Since data on sectoral disbursements are available only after 1990, the measure of per capita aid flows to sector s, aid^s_{it}, is constructed using sectoral commitments as a proxy for sectoral disbursements. In particular, we follow Clemens *et al.* (2004) and Thiele *et al.* (2006) and assume that the proportion of aid actually disbursed to sector s is equal to the proportion of aid committed to sector s, and hence that

$$aid^s_{it} \approx \frac{commit^s_{it}}{\sum_s commit^s_{it}} \sum_s aid^s_{it}, \tag{16}$$

where $commit^s_{it}$ is the amount of ODA commitments to sector s. Approximating sectoral disbursements with sectoral commitments may cause some concerns due to differences in definitions and statistical record (see Clemens *et al.*, 2004, for more details). However, according to Odedokun (2003) and Clemens *et al.* (2004) this problem is likely to be small since disbursements and commitments (both on the aggregate and sectoral levels) are highly correlated. Also, annual discrepancies are likely to be larger than averages,

and we thus average the data over five-year intervals.

Aid is decomposed into two broad categories according to its purpose of investment:

- Aid invested in complementary inputs: aid oriented to social infrastructure (such as education, health, and water supply projects) and economic infrastructure (such as energy, transportation and communications projects).
- Aid invested in physical capital: contributions to directly productive sectors (such as agriculture, manufacturing, trade, banking and tourism projects).

These two aid categories capture the main characteristics of aid_A and aid_K: aid invested in complementary factors is intended to generate positive spillover effects (public goods, inputs complementary to physical capital) whereas aid invested in physical capital has a more narrow purpose and could more easily have been undertaken by private investors. Other sectoral aid categories (like multisector support, programme assistance, debt reorganisation, emergency assistance and unallocated types of aid) are excluded from the analysis since they are primarily oriented to provide fiscal budget support in the recipient country.[5]

5 Results

Figure 1 in Appendix shows the partial correlation between FDI and aid invested in physical capital. While there seems to be a negative relationship between the two variables, it is difficult to assess if there is full crowding out from the downwards sloping line (that is, to assess if the slope is -1). Figure 2 in Appendix depicts the partial correlation between FDI and aid invested in complementary goods. The figure clearly indicates that the two variables are positively correlated and that the relationship might not be linear. However, the exact predictions from the theoretical model can only be tested in a more comprehensive framework where country-specific characteristics capture the cross-sectional heteroskedasticity clearly prevalent in the figures.

Results from estimating equations (13)–(15) for a sample of 84 countries using five-year intervals are reported in Table 1. Independently of the chosen estimator, our results strongly support the notion that aid invested in complementary factors has a catalysing effect on FDI. This means that the short-run replacement effect of aid_A on FDI is outweighed by the positive effect that complementary aid has on the long-run levels of income and capital per capita. A Hausman test confirms the significance of fixed effects, and the highly significant lagged dependent variable suggests that we should rely on the consistent

[5] Section 6 includes a test for robusteness of the results with respect to the definition of complementary aid, and a note about the changes in the results when variables possibly correlated with aid_A are included in the regressions.

Table 1: FDI and Foreign Aid

	(1) POLS	(2) FE	(3) GMM-DIF	(4) GMM-SYS	(5) GMM-SYS
aid_K	−0.59	−1.56***	−0.77***	−0.94***	−0.88***
	[0.8]	[0.3]	[0.2]	[0.2]	[0.2]
aid_A	1.67***	1.71***	1.34***	1.24***	1.07***
	[0.5]	[0.2]	[0.2]	[0.2]	[0.2]
aid_A, squared	−0.0028***	−0.0012*	−0.0015***	−0.0015***	−0.0013***
	[0.0006]	[0.0007]	[0.0002]	[0.0002]	[0.0002]
Savings, sy	29.7*	−32.3	1.11	20.5***	−20.2
	[16]	[24]	[23]	[7.8]	[17]
Pop. growth, n	−7.26**	−0.97	1.05	−3.7	−2.19
	[3.5]	[1.4]	[1.6]	[2.5]	[1.8]
fdi_{t-1}			0.045	0.40***	0.38***
			[0.1]	[0.09]	[0.1]
GDP per capita					13.7***
					[4.1]
Constant	12.9	.	.	5.04	1.14
	[14]	.	.	[8.5]	[6.0]
Observations	289	277	217	289	289
R^2	0.11	0.08	.	.	.
N. countries	84	72	76	84	84
Model specification tests:					
Hansen-Sargan overid.	(0.21)	(0.88)	(0.15)	(0.34)	(0.79)
Underid.	(0.0028)	(0.0)	.	.	.
Cragg-Donald F	(0.0021)	(0.0)	.	.	.
Anderson F joint sig F	(0.0)	(0.0)	.	.	.
DWH p	(0.071)	(0.0026)	.	.	.
AR(1)	.	.	(0.00)	(0.21)	(0.75)
AR(2)	.	.	(0.77)	.	.
Hypothesis tests on marginal effects evaluated at the median:					
ME of $aid_K = -1$	0.41	−0.56	0.23	0.06	0.12
	[0.83]	[0.30]	[0.19]	[0.25]	[0.21]
ME of $aid > 0$	0.96**	0.10	0.50***	0.24***	0.13**
	[0.52]	[0.37]	[0.13]	[0.09]	[0.07]
ME of $aid_A > 0$	1.55***	1.66***	1.27***	1.18***	1.02***
	[0.51]	[0.18]	[0.16]	[0.22]	[0.22]

Notes. *** p<0.01, ** p<0.05, * p<0.1. Robust standard errors in brackets, p-values in parentheses. The dependent variable is FDI per capita. All regressions include time dummies. Aid variables are instrumented with own lags, interactions with GDP per capita, log(pop) and a FRZ dummy.

and efficient Arellano and Bond (1991) GMM estimator in our further analysis. When the time series are persistent, the first-difference GMM (GMM-DIF) estimator is poorly behaved since under such conditions lagged levels of the variables are only weak instruments for subsequent first-differences. We therefore rely on the system GMM (GMM-SYS) estimator suggested by Arellano and Bover (1995) and Blundell and Bond (1998). All variables are treated as endogenous, which means that instruments should be lagged two periods or more to be valid.

The results in column (4) in Table 1 show that, for a given domestic savings rate, one aid dollar invested in complementary factors draws in 1.24 dollars of FDI, both in per capita terms. The square of complementary aid is negative and significant, suggesting that the "savings" effect described in equation (9) dominates for sufficiently high levels of aid_A. Evaluated at the median of the sample, our results indicate that the marginal effect of aid_A on fdi is 1.18, and a Wald test confirms it to be significantly positive. Having specified a dynamic model, we can calculate the long run effect of aid_A by assuming a that the level of FDI per capita is the same in every period. Evaluating at the median, we find that one additional aid dollar per capita invested in complementary factors draws in 1.97 (1.18/0.6) dollars of FDI per capita in the long run. We conclude from this that aid_A generates important short run as well as long run benefits for foreign investors. The results also confirm the crowding out effect of aid invested in physical capital, since one aid dollar per capita invested in physical capital replaces 0.94 dollars of fdi, which accumulate to 1.57 dollars in the long run (0.94/0.6).

The effect of population growth is insignificant throughout the analysis. But, contrary to the prediction from our model, we find a positive rather than a negative effect of domestic savings on fdi. A plausible explanation is that foreign investors look explicitly at data on national savings when making their investment decisions and interpret a high s as a signal of sustained growth history and good economic prospects.[6] To adjust for this positive externality we include GDP per capita in column (5). Adjusting for the purchasing power of the population leaves savings insignificant and negative, which suggest that once we correct for the positive signalling effect of a high saving rate, domestic and foreign capital are substitutes as suggested by the theoretical model.

Finally, we perform some tests of hypothesis and present the results at the bottom of the Table. We test the Caselli and Feyrer (2007) conjecture that aid invested in physical capital replaces FDI one for one. The Wald tests show that we cannot reject its validity in most of the cases. We also find that the combined effect of aid_A and aid_K is significantly positive and between 0.21 and 0.24 (evaluated at the median of the sample), which implies that the substitution effect of aid_K is more than outweighed by the positive effects of aid_A

[6] This is in line with evidence showing that the households with the highest lifetime incomes are the ones with highest lifetime saving rates (Carroll, 2000), and that higher growth rates lead to higher savings rates (Carroll, Overland and Weil, 2000; Loayza, Schmidt-Hebbel and Servén, 2000).

on fdi in a typical country. If the marginal effects are evaluated at the mean instead of the median, our conclusions remain the same.

6 Robustness

In light of the important policy implications arising from our results, it is necessary to ensure that these results are robust to correcting for possible misspecifications in the empirical relationship between FDI and aid. We carry out three basic checks for robustness of our empirical findings.

6.1 Technical Assistance

The grouping of aid variables could be questioned. In particular, aid in this paper does not include Technical Cooperation Grants (TCGs), which contribute to development primarily through education and training. Since TCGs consist of activities involving the supply of human resources or actions targeted on human resources (education, training, and advice) one could easily argue that TCGs would have the same impact as aid invested in complementary factors. In the Appendix (Table 4) we therefore replicate the specifications from Table 1 using an extended definition of aid_A that includes also TCGs from the OECD database. Although there is a slight drop in the size of the coefficients, the results from Table 1 carry over.

6.2 Imperfect Capital Mobility

If mobility of capital is imperfect, MPK should be allowed to deviate from the gross world interest rate by a risk-premium, ρ, that reflects idiosyncratic country characteristics. In this case, the first-order condition in (4) should read

$$r + \rho = \text{MPK}, \tag{17}$$

and the capital stock in (5) should be redefined accordingly:

$$k^* = \left[\frac{A\alpha}{r+\rho}\right]^{\frac{1}{1-\alpha}}. \tag{18}$$

While this renders the effect of aid invested in physical capital unchanged, the effect of complementary aid becomes somewhat more complicated. The risk premium impact FDI directly through (18) but, given that

$$\frac{\partial k^*}{\partial aid_A} = \frac{\partial}{\partial aid_A}\left(\left[\frac{A\alpha}{r+\rho}\right]^{\frac{1}{1-\alpha}}\right) = \frac{1}{1-\alpha}\left[\frac{A\alpha}{r+\rho}\right]^{\frac{\alpha}{1-\alpha}}\frac{L\alpha}{r+\rho}, \tag{19}$$

the marginal effect of aid_A will also depend on the risk premium and thus on country-specific characteristics. To capture this econometrically, we include the risk premium level and its interaction with aid_A, and estimate

$$\begin{aligned} fdi_{it} &= \alpha_t + \alpha_i + \beta_0 + \beta_1 n_{it} + \beta_2 S_{it} + \beta_3 aid_{it}^K + \beta_4 aid_{it}^A + \beta_5 \left(aid_{it}^A\right)^2 \\ &\quad + \beta_6 \rho_{it} + \beta_7 \left(aid_{it}^A \times \rho_{it}\right) + u_{it}. \end{aligned} \tag{20}$$

β_6 and β_7 are expected to be negative because higher risk reduces country i's attractiveness as an investment location.

To capture the risk premium we include the overall International Country Risk Guide rating as well as its three subcategories of risk: political, financial and economic.[7] All risk variables are treated as endogenous. In general, lower political risk is associated with higher levels of overall accountability, stability and institutional quality in the political process. In particular, from the ICRG rankings, political risk is lower (1) the higher the government stability, (2) the better the socioeconomic conditions and the investment profile, (3) the lower the number of internal conflicts, external conflicts and political corruption, (4) the lower the military is involved in politics, (5) the lower the religious and the ethnic tensions, (6) the higher the prevalence of law and order, and (7) the larger the degrees of democratic accountability and bureaucratic quality. Results from estimating (20) including these political risk measures are reported in Table 2.[8]

The political risk variable enters only significantly in four cases. Relative absence of external conflict, low level of religious tensions and a high level of democratic accountability suggest all a lower risk premium and tend to attract foreign investors. However, the prevalence of law and order shows a negative impact on FDI inflows (significant only at the 10% level, though). This counter intuitive result might be due to the fact that we have already accounted for domestic savings, which will be highly correlated with this risk variable: countries characterised by high prevalence of law and order tend to have higher domestic saving.

The interactions between complementary aid and the political risk indicator are more often significant, and the results suggest that government stability, favourable socioeconomic conditions, an attractive investment profile, low military interference in politics and better bureaucratic quality are all supportive of a high steady-state level of capital. Although the results show a negative impact of the interaction between aid_A and the index for low degree of religious tensions, the net marginal effect on FDI remains positive.

Table 3 presents similar estimations taking into account different economic and finan-

[7] In order to detect significant effects of aid on FDI, Karakaplan et al. (2005) and Harms and Lutz (2006) use aid interacted with the Kaufmann et al. (2005) governance indicators to capture differences in government effectiveness.

[8] For the results in Table 2, a high value of the different political-risk measures is associated with a low overall political risk, and hence, a high value of the different risk measures should have a positive effect on fdi.

Table 2: FDI and Foreign Aid — Political Risk

		Political risk											
Risk measure:	ICRG index (1)	Govt. stab. (2)	Socio-ec. condit. (3)	Investm. profile (4)	Internal conflict (5)	External conflict (6)	Political corrupt. (7)	Military in politics (8)	Religious tensions (9)	Law and Order (10)	Ethnic tensions (11)	Democ. account. (12)	Bureauc. quality (13)
aid_K	$-0.78^{\bullet}$	-0.69^{**}	$-0.80^{\bullet}$	-0.68^{**}	$-0.99^{\bullet}$	$-0.96^{\bullet}$	$-0.92^{\bullet}$	-0.65^{**}	$-0.96^{\bullet}$	$-1.00^{\bullet}$	$-0.98^{\bullet}$	$-0.87^{\bullet}$	-0.71^{**}
	[0.3]	[0.3]	[0.2]	[0.3]	[0.2]	[0.3]	[0.3]	[0.3]	[0.2]	[0.2]	[0.3]	[0.3]	[0.3]
aid_A	0.34	0.48	0.41^{*}	0.36	$1.32^{\bullet}$	$1.30^{\bullet}$	1.06^{*}	0.71^{*}	$1.57^{\bullet}$	$1.24^{\bullet}$	$1.55^{\bullet}$	$1.14^{\bullet}$	0.92^{**}
	[0.7]	[0.6]	[0.2]	[0.5]	[0.2]	[0.5]	[0.6]	[0.4]	[0.2]	[0.4]	[0.3]	[0.3]	[0.4]
aid_A, squared	$-0.0016^{\bullet}$	$-0.0015^{\bullet}$	$-0.0016^{\bullet}$	$-0.0015^{\bullet}$	$-0.0016^{\bullet}$	$-0.0015^{\bullet}$	$-0.0014^{\bullet}$	$-0.0015^{\bullet}$	$-0.0014^{\bullet}$	$-0.0016^{\bullet}$	$-0.0015^{\bullet}$	$-0.0014^{\bullet}$	$-0.0015^{\bullet}$
	[0.0002]	[0.0002]	[0.0002]	[0.0002]	[0.0003]	[0.0002]	[0.0003]	[0.0002]	[0.0002]	[0.0002]	[0.0002]	[0.0002]	[0.0002]
$aid_A \times$Risk	0.014	0.094^{**}	$0.13^{\bullet}$	0.11^{**}	0.00088	−0.0025	0.062	0.13^{**}	$-0.083^{\bullet}$	0.038	−0.056	0.013	0.14^{**}
	[0.009]	[0.04]	[0.02]	[0.04]	[0.03]	[0.04]	[0.2]	[0.06]	[0.02]	[0.09]	[0.05]	[0.05]	[0.06]
Risk	−0.1	−4.56	−0.6	−0.6	−2.01	4.77^{*}	0.83	−4.59	5.94^{*}	-10.9^{*}	0.8	8.58^{**}	−4.21
	[0.6]	[4.0]	[3.3]	[3.6]	[1.9]	[2.6]	[7.0]	[3.5]	[3.1]	[5.7]	[3.6]	[4.2]	[4.5]
fdi_{t-1}	$0.41^{\bullet}$	$0.41^{\bullet}$	$0.41^{\bullet}$	$0.43^{\bullet}$	$0.43^{\bullet}$	$0.42^{\bullet}$	$0.40^{\bullet}$	$0.45^{\bullet}$	$0.39^{\bullet}$	$0.43^{\bullet}$	$0.42^{\bullet}$	$0.42^{\bullet}$	$0.39^{\bullet}$
	[0.10]	[0.09]	[0.10]	[0.09]	[0.09]	[0.09]	[0.1]	[0.10]	[0.1]	[0.10]	[0.10]	[0.1]	[0.09]
Savings, sy	16.3^{*}	$21.7^{\bullet}$	21.2^{**}	$20.4^{\bullet}$	$24.0^{\bullet}$	18.2^{**}	22.0^{**}	19.5^{**}	$26.0^{\bullet}$	$26.7^{\bullet}$	22.1^{**}	$21.2^{\bullet}$	22.2^{**}
	[8.2]	[7.9]	[10]	[7.4]	[7.8]	[8.0]	[8.9]	[7.9]	[8.4]	[8.4]	[8.6]	[6.5]	[8.9]
Pop. gr., n	-4.99^{*}	−4.23	$-8.74^{\bullet}$	-5.79^{**}	-5.61^{**}	-5.30^{**}	-6.03^{**}	-5.13^{*}	-7.10^{**}	-6.29^{**}	$-7.98^{\bullet}$	-4.09^{*}	-6.11^{**}
	[2.8]	[2.5]	[3.1]	[2.6]	[2.8]	[2.6]	[2.9]	[2.9]	[2.8]	[2.9]	[3.0]	[2.5]	[2.7]
Observations	233	231	231	231	231	231	231	231	231	231	231	231	231
N. Countries	72	72	72	72	72	72	72	72	72	72	72	72	72
Sargan test	(1.00)	(0.98)	(0.97)	(0.99)	(0.98)	(0.97)	(0.99)	(0.98)	(0.97)	(0.96)	(0.98)	(0.96)	(0.99)
AR(1)	(0.91)	(0.81)	(0.53)	(0.79)	(0.69)	(0.76)	(0.70)	(0.98)	(0.43)	(0.59)	(0.59)	(0.71)	(0.91)
Hypothesis tests on marginal effects evaluated at the median:													
ME $aid_K = -1$	0.22	0.31	0.20	0.32	0.01^{**}	0.04	0.08	0.35	0.04	$0.00^{\bullet}$	0.02^{*}	0.13	0.29
	[0.26]	[0.34]	[0.20]	[0.28]	[0.23]	[0.28]	[0.28]	[0.31]	[0.23]	[0.25]	[0.25]	[0.26]	[0.34]
ME of $aid > 0$	$0.35^{\bullet}$	$0.48^{\bullet}$	$0.22^{\bullet}$	$0.29^{\bullet}$	$0.27^{\bullet}$	0.26^{**}	$0.26^{\bullet}$	$0.40^{\bullet}$	0.14^{**}	$0.29^{\bullet}$	$0.28^{\bullet}$	$0.25^{\bullet}$	$0.43^{\bullet}$
	[0.09]	[0.14]	[0.05]	[0.06]	[0.07]	[0.14]	[0.11]	[0.12]	[0.08]	[0.11]	[0.08]	[0.08]	[0.12]
ME $aid_A > 0$	$1.12^{\bullet}$	$1.16^{\bullet}$	$1.02^{\bullet}$	$0.97^{\bullet}$	$1.26^{\bullet}$	$1.21^{\bullet}$	$1.19^{\bullet}$	$1.04^{\bullet}$	$1.10^{\bullet}$	$1.28^{\bullet}$	$1.26^{\bullet}$	$1.12^{\bullet}$	$1.13^{\bullet}$
	[0.22]	[0.23]	[0.21]	[0.26]	[0.23]	[0.24]	[0.25]	[0.24]	[0.25]	[0.21]	[0.25]	[0.25]	[0.26]

Notes. Robust standard errors in brackets and p-values in parentheses. $^{\bullet}$ p<0.01, ** p<0.05, * p<0.1. The dependent variable is FDI per capita. All regressions include a constant and time dummies. External instruments for the aid variables are interactions with log(population), GDP per capita and a FRZ dummy.

Table 3: FDI and Foreign Aid — Economic and Financial Risks

	Economic risk					**Financial risk**				
Risk measure:	GDP per capita (1)	GDP growth (2)	Inflation rate (3)	Budget balance (4)	Curr. Acc. balance (5)	Foreign debt to GDP (6)	Foreign debt service to exp. (7)	Curr. Acc. to exports (8)	Reserves to imp. months (9)	Exch. rate stability (10)
aid_K	-0.94^{***}	-0.89^{***}	-0.92^{***}	-1.14^{***}	-0.81^{***}	-0.89^{***}	-0.94^{***}	-0.89^{***}	-0.93^{***}	-0.95^{***}
	[0.2]	[0.2]	[0.3]	[0.2]	[0.3]	[0.2]	[0.3]	[0.3]	[0.2]	[0.3]
aid_A	1.14^{***}	1.06^{***}	1.25^{***}	1.32^{***}	1.17^{***}	1.52^{***}	1.28^{***}	1.20^{***}	1.09^{***}	1.29^{***}
	[0.2]	[0.2]	[0.2]	[0.2]	[0.2]	[0.3]	[0.3]	[0.2]	[0.3]	[0.2]
aid_A, squared	-0.0014^{***}	-0.0014^{***}	-0.0015^{***}	-0.0015^{***}	-0.0016^{***}	-0.0015^{***}	-0.0015^{***}	-0.0015^{***}	-0.0014^{***}	-0.0015^{***}
	[0.0002]	[0.0002]	[0.0002]	[0.0001]	[0.0002]	[0.0002]	[0.0002]	[0.0002]	[0.0002]	[0.0002]
$aid_A \times$Risk	0.019	0.028^{***}	-0.23	-2.53^{***}	-0.027^{*}	-0.39^{**}	0.0023	-0.58	0.042	-0.38
	[0.03]	[0.009]	[0.2]	[0.5]	[0.01]	[0.2]	[0.005]	[0.7]	[0.04]	[0.3]
Risk	11.9^{***}	-1.62	9.16	13	0.46	17.0^{**}	0.45	11.9	-6.20^{***}	13.7
	[4.5]	[1.1]	[7.7]	[101]	[0.6]	[7.4]	[0.4]	[20]	[1.3]	[9.8]
fdi_{t-1}	0.39^{***}	0.41^{***}	0.43^{***}	0.30^{***}	0.43^{***}	0.41^{***}	0.47^{***}	0.41^{***}	0.39^{***}	0.44^{***}
	[0.1]	[0.1]	[0.10]	[0.06]	[0.1]	[0.1]	[0.1]	[0.1]	[0.1]	[0.10]
Savings, sy	-17.3	24.2^{***}	19.8^{**}	18.2^{**}	19.8^{***}	22.8^{**}	14.5	20.7^{**}	27.7^{***}	19.0^{**}
	[18]	[8.9]	[7.9]	[8.1]	[7.4]	[9.0]	[9.4]	[8.2]	[9.0]	[7.5]
Pop. gr., n	-4.28^{*}	-6.72^{**}	-5.72^{*}	-7.85^{***}	-6.71^{**}	-9.21^{***}	-4.85^{*}	-6.11^{**}	-7.38^{**}	-5.18^{*}
	[2.3]	[2.6]	[2.9]	[2.8]	[3.1]	[3.3]	[2.6]	[2.9]	[2.8]	[2.8]
Observations	233	233	229	203	223	229	219	223	218	233
N. Countries	72	72	71	65	72	70	70	72	70	72
Sargan test	(0.00)	(1.00)	(1.00)	(0.00)	(1.00)	(0.00)	(1.00)	(0.00)	(1.00)	(1.00)
AR(1)	(0.51)	(0.50)	(0.90)	(0.63)	(0.88)	(0.72)	(0.84)	(0.82)	(0.73)	(0.91)
Hypothesis tests on marginal effects evaluated at the median:										
ME $aid_K = -1$	0.06	0.11	0.08	-0.14	0.19	0.11	0.06	0.11	0.07	0.05
	[0.20]	[0.22]	[0.26]	[0.16]	[0.25]	[0.22]	[0.25]	[0.26]	[0.22]	[0.26]
ME of $aid > 0$	0.15^{*}	0.21^{***}	0.25^{***}	0.17^{***}	0.37^{***}	0.34^{***}	0.32^{***}	0.32^{***}	0.25^{***}	0.24^{***}
	[0.11]	[0.05]	[0.09]	[0.06]	[0.10]	[0.07]	[0.07]	[0.10]	[0.07]	[0.09]
ME of $aid_A > 0$	1.10^{***}	1.09^{***}	1.17^{***}	1.31^{***}	1.19^{***}	1.23^{***}	1.26^{***}	1.20^{***}	1.17^{***}	1.19^{***}
	[0.19]	[0.22]	[0.21]	[0.15]	[0.20]	[0.22]	[0.23]	[0.22]	[0.20]	[0.22]

Notes. Robust standard errors in brackets and p-values in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is FDI per capita. All regressions include a constant and time dummies. External instruments for the aid variables are interactions with log(population), GDP per capita and a FRZ dummy.

cial risk measures. The economic risk variables reflect the macroeconomic situation and the economic advancement of the host country: GDP per capita, real GDP growth, inflation, the budget balance as a share of GDP and the current account as a share of GDP. The financial risk variables assess a country's ability to finance its official, commercial and trade debt obligations: external debt as a share of GDP, debt service as a share of exports, the current account as a share of export, international liquidity as months of import cover and exchange rate stability (calculated here as the annual change in the real exchange rate).[9] Results in Table 3 keep our overall conclusions unchanged. It is interesting to note, however, that the political risk variables seem to be more important to foreign investors than the economic and financial risk variables.

6.3 Omitted Variables

Tables 2 and 3 show a positive impact from the savings rate on fdi. We adjust for this in Tables 5 and 6 including the level of GDP per capita in the regressions. As in Table 1, the effect of savings disappears and it is captured by the level of GDP per capita, which supports our results previously suggesting the existence of positive externalities from s to fdi.

However, it is important to notice that once we adjust for the risk of investing abroad by including various proxies for the risk premium, population growth turns out to have a significantly *negative* impact on fdi in both Tables 2 and 3. One explanation might be that a fast growing population is attractive for the efficiency-seeking investor but that the quality of the abundant labour in some countries might be too poor to attract foreign investors. In this case, a fast growing population might instead cause social tensions and excessive burdens on the public system, which will tend to scare away foreign investors rather than draw in more investments.[10] We therefore add the primary school enrolment rate from the World Development Indicators (2005) in Tables 5 and 6, to take the quality of the labour force and the level of development into account.[11] In many cases, the adjustment for the quality of the labour force means that population growth no longer enters significant and in the remaining cases it reduces the size of the initially negative effect on fdi. It is interesting noticing that the adjustment for the level of human capital reduces the size of the effect of aid_A on fdi. This means that the aid_A variable is picking up the information that we intend, and thus substantiates our choice and definition of different types of aid.

[9] Similar to the case of the political risk indexes, all these different measures reflect lower overall levels of economic and financial risk.

[10] This is in line with Mankiw, Romer and Weil's (1992) point that a higher population growth rate implies lower per capita human capital levels and thus lower MPK levels. This will have a negative impact on FDI.

[11] The data on school enrolment is highly unbalanced, so we interpolated within countries to fill in gaps, and extended the series with the first and the last values to complete the extremes. The correlation between the original and the transformed series is above 0.98 in both cases.

Finally, while our empirical specification includes both variables predicted by our theoretical model as well as a rich specification of idiosyncratic country characteristics, there might be additional variables that play a role in the allocation choice of foreign investors. To test for this, further regressions included measures of market potential (regional dummies, urban population and rural population), factor market characteristics (size of the labour force, average years of schooling) and market access (openness, number of vehicles, transportation network density, telephone lines and rail lines). None of them turned out significant or to have a qualitative impact on our results. These results are available upon request.

7 Conclusion

Due to its potential to transfer knowledge and technology, create jobs, boost overall productivity, and enhance competitiveness and entrepreneurship, attracting FDI to developing countries is essential to contribute to economic growth, development and poverty reduction. Given the emphasis on using ODA as a vehicle for creating a private sector enabling environment, the question of whether or not aid flows induce significantly more FDI inflows becomes an important and relevant question not only on its own right but also as an essential element in the aid effectiveness debate.

The results strongly support the hypotheses that aid invested in inputs complementary to physical capital draws in foreign capital, while aid directly invested in physical capital crowds out private foreign investments. While the impact of the two types of aid together is positive, an important policy implication is that the composition of foreign aid matters and that more aid should be directed towards complementary inputs. Such investments improve the absorption capacity of the recipient country and increase MPK in the host country, which allows it to accumulate more foreign capital without experiencing a drop in domestic investments or a flight of foreign capital.

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Figure 1: FDI and Aid to Physical Capital (aid_K)

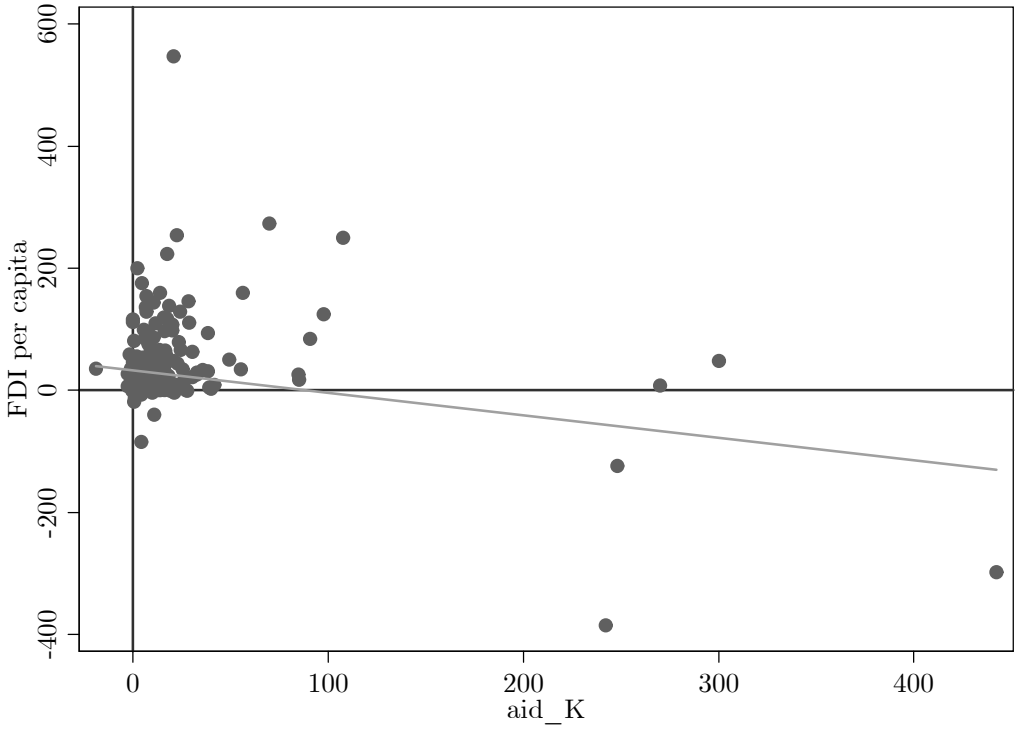

Figure 2: FDI and Aid to Complementary Factors (aid_A)

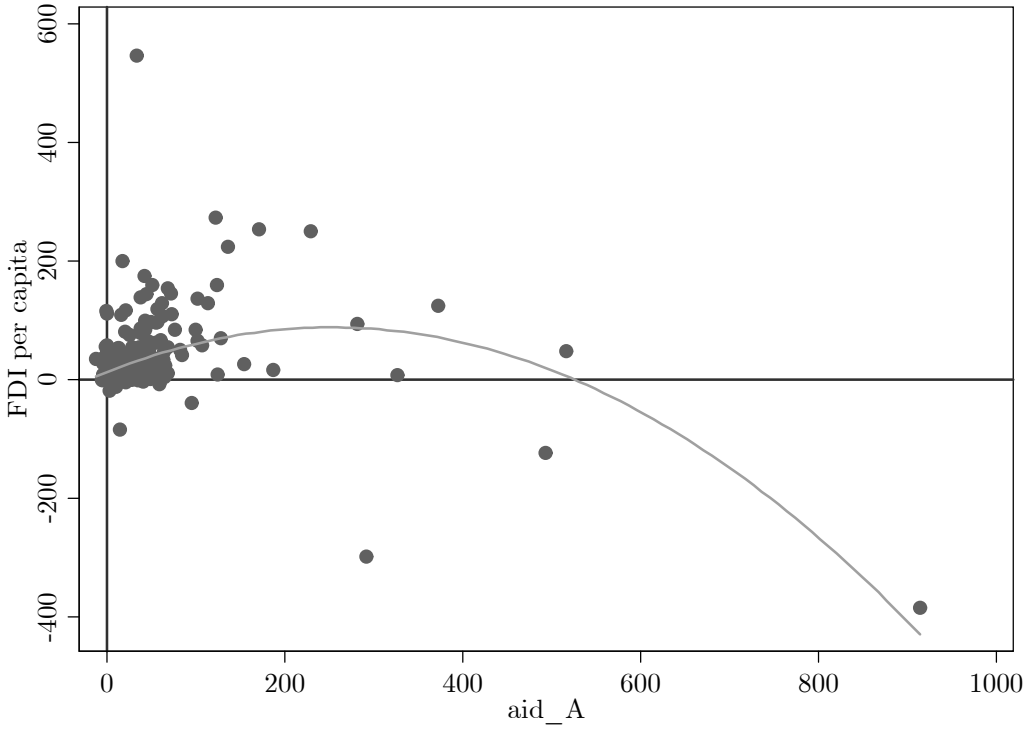

Table 4: FDI and Foreign Aid — Alternative Definition of aid_A

	(1) POLS	(2) FE	(3) GMM-DIF	(4) GMM-SYS	(5) GMM-SYS
aid_K	−0.29	−1.47***	−0.71***	−0.75***	−0.74***
	[0.8]	[0.2]	[0.2]	[0.3]	[0.2]
$aid_A^\dagger$	1.09***	1.65***	1.33***	0.97***	0.87***
	[0.4]	[0.2]	[0.2]	[0.2]	[0.2]
$aid_A^\dagger$, squared	−0.0020***	−0.0012**	−0.0015***	−0.0012***	−0.0011***
	[0.0004]	[0.0006]	[0.0002]	[0.0002]	[0.0002]
Savings, sy	38.5**	−25.8	6.62	26.5**	−20.3
	[17]	[22]	[20]	[10]	[18]
Pop. growth, n	−8.91**	−1.7	0.52	−5.50*	−3.18
	[4.1]	[1.4]	[1.4]	[3.2]	[2.3]
fdi_{t-1}			0.018	0.37***	0.36***
			[0.1]	[0.1]	[0.1]
GDP per capita					15.4***
					[4.3]
Constant	18.8	.	.	5.73	−0.99
	[13]	.	.	[10]	[6.7]
Observations	289	277	217	289	289
R^2	0.11	0.08	.	.	.
N. countries	84	72	76	84	84
Model specification tests:					
Hansen-Sargan overid.	(0.12)	(0.53)	(0.11)	(0.30)	(0.86)
Underid.	(0.0017)	(0.0)	.	.	.
Cragg-Donald F	(0.0013)	(0.0)	.	.	.
Anderson F joint sig F	(0.0)	(0.0)	.	.	.
DWH p	(0.17)	(0.0018)	.	.	.
AR(1)	.	.	(0.00)	(0.12)	(0.54)
AR(2)	.	.	(0.69)	.	.
Hypothesis tests on marginal effects evaluated at the median:					
ME of $aid_K = -1$	0.71	−0.47	0.29	0.25	0.26
	[0.80]	[0.24]	[0.19]	[0.28]	[0.22]
ME of $aid > 0$	0.71	0.13	0.56***	0.17*	0.07
	[0.57]	[0.33]	[0.15]	[0.11]	[0.08]
ME of $aid_A^\dagger > 0$	1.00***	1.60***	1.26***	0.92***	0.82***
	[0.35]	[0.14]	[0.16]	[0.23]	[0.21]

Notes. *** p<0.01, ** p<0.05, * p<0.1. Robust standard errors in brackets, p-values in parentheses. The dependent variable is FDI per capita. All regressions include time dummies. Aid variables are instrumented with own lags, interactions with GDP per capita, log(pop) and a FRZ dummy. $aid_A^\dagger$ is defined as aid_A + technical cooperation grants.

Table 5: FDI and Foreign Aid — Political Risk (extended model)

		Political risk											
Risk measure:	ICRG index (1)	Govt. stab. (2)	Socio-ec. condit. (3)	Investm. profile (4)	Internal conflict (5)	External conflict (6)	Political corrupt. (7)	Military in politics (8)	Religious tensions (9)	Law and Order (10)	Ethnic tensions (11)	Democ. account. (12)	Bureauc. quality (13)
aid_K	$-0.77^{\bullet}$	-0.66^{**}	$-0.78^{\bullet}$	$-0.66^{\bullet}$	$-0.93^{\bullet}$	$-0.93^{\bullet}$	$-0.89^{\bullet}$	-0.68^{**}	$-0.93^{\bullet}$	$-1.00^{\bullet}$	$-0.91^{\bullet}$	$-0.85^{\bullet}$	-0.71^{**}
	[0.2]	[0.3]	[0.1]	[0.2]	[0.2]	[0.2]	[0.2]	[0.3]	[0.2]	[0.2]	[0.2]	[0.2]	[0.3]
aid_A	0.31	0.43	0.37^{*}	0.28	$1.16^{\bullet}$	$1.22^{\bullet}$	1.03^{*}	0.70^{**}	$1.43^{\bullet}$	$1.28^{\bullet}$	$1.37^{\bullet}$	$1.05^{\bullet}$	0.85^{**}
	[0.6]	[0.5]	[0.2]	[0.4]	[0.2]	[0.4]	[0.6]	[0.3]	[0.2]	[0.3]	[0.3]	[0.3]	[0.3]
aid_A, squared	$-0.0015^{\bullet}$	$-0.0014^{\bullet}$	$-0.0015^{\bullet}$	$-0.0014^{\bullet}$	$-0.0014^{\bullet}$	$-0.0014^{\bullet}$	$-0.0013^{\bullet}$	$-0.0014^{\bullet}$	$-0.0014^{\bullet}$	$-0.0015^{\bullet}$	$-0.0014^{\bullet}$	$-0.0014^{\bullet}$	$-0.0014^{\bullet}$
	[0.0002]	[0.0002]	[0.0002]	[0.0002]	[0.0002]	[0.0002]	[0.0003]	[0.0002]	[0.0002]	[0.0002]	[0.0002]	[0.0002]	[0.0002]
$aid_A \times$Risk	0.013	0.082^{**}	$0.13^{\bullet}$	$0.10^{\bullet}$	0.0028	−0.0059	0.032	0.11^{*}	$-0.064^{\bullet}$	−0.018	−0.045	0.016	0.12^{**}
	[0.009]	[0.03]	[0.02]	[0.03]	[0.03]	[0.03]	[0.2]	[0.06]	[0.02]	[0.07]	[0.04]	[0.05]	[0.06]
Risk	−0.25	−4.02	0.22	−1.81	−3.19	2.5	−1.06	-6.69^{**}	2.43	-10.9^{**}	-6.71^{*}	5.48	-7.14^{*}
	[0.6]	[3.2]	[2.5]	[3.1]	[2.1]	[2.4]	[4.4]	[3.3]	[2.9]	[4.4]	[3.9]	[3.4]	[4.2]
fdi_{t-1}	$0.39^{\bullet}$	$0.39^{\bullet}$	$0.39^{\bullet}$	$0.41^{\bullet}$	$0.41^{\bullet}$	$0.40^{\bullet}$	$0.39^{\bullet}$	$0.43^{\bullet}$	$0.39^{\bullet}$	$0.43^{\bullet}$	$0.40^{\bullet}$	$0.41^{\bullet}$	$0.38^{\bullet}$
	[0.1]	[0.1]	[0.1]	[0.1]	[0.1]	[0.1]	[0.1]	[0.1]	[0.1]	[0.1]	[0.1]	[0.1]	[0.1]
Savings, sy	−18.1	−5.86	−16.8	−10.7	−10.7	−14.8	−14.1	−12.4	−8.53	−9.07	−19.7	−7.25	−7.2
	[18]	[17]	[20]	[17]	[17]	[18]	[19]	[18]	[20]	[17]	[18]	[18]	[19]
Pop. gr., n	−3.8	−3.37	$-8.15^{\bullet}$	-4.85^{*}	−4.05	-5.30^{*}	−4.58	−4.71	-6.15^{**}	-5.99^{**}	-6.33^{*}	-4.54^{*}	-5.02^{*}
	[2.6]	[2.5]	[2.9]	[2.6]	[2.8]	[2.9]	[3.0]	[2.9]	[2.9]	[3.0]	[3.2]	[2.5]	[2.8]
GDP p. cap.	11.8^{**}	8.75^{**}	$12.1^{\bullet}$	10.3^{**}	$11.7^{\bullet}$	$11.6^{\bullet}$	$11.7^{\bullet}$	11.3^{**}	10.9^{**}	$12.5^{\bullet}$	$15.2^{\bullet}$	9.53^{**}	9.81^{**}
	[4.6]	[4.1]	[4.4]	[4.2]	[4.0]	[4.3]	[4.1]	[5.0]	[4.5]	[4.0]	[4.8]	[4.4]	[4.6]
Prim. school.	0.061	0.18	−0.015	0.096	0.14	−0.031	0.12	0.14	0.012	−0.0003	0.085	−0.037	0.18
	[0.2]	[0.2]	[0.2]	[0.2]	[0.2]	[0.2]	[0.2]	[0.2]	[0.2]	[0.2]	[0.2]	[0.2]	[0.2]
Observations	233	231	231	231	231	231	231	231	231	231	231	231	231
N. Countries	72	72	72	72	72	72	72	72	72	72	72	72	72
Sargan test	(1.00)	(1.00)	(1.00)	(1.00)	(1.00)	(1.00)	(1.00)	(0.67)	(1.00)	(0.00)	(1.00)	(1.00)	(1.00)
AR(1)	(0.36)	(0.29)	(0.44)	(0.40)	(0.73)	(0.57)	(0.62)	(0.37)	(0.88)	(0.95)	(0.81)	(0.67)	(0.49)
Hypothesis tests on marginal effects evaluated at the median:													
ME $aid_K = -1$	0.23	0.34	0.22	0.34	0.07	0.07	0.11	0.32	0.07	$0.00^{\bullet}$	0.09	0.15	0.29
	[0.21]	[0.29]	[0.15]	[0.22]	[0.19]	[0.24]	[0.25]	[0.27]	[0.20]	[0.23]	[0.21]	[0.20]	[0.28]
ME of $aid > 0$	$0.27^{\bullet}$	$0.37^{\bullet}$	$0.15^{\bullet}$	$0.21^{\bullet}$	$0.19^{\bullet}$	0.17^{*}	0.17^{**}	$0.29^{\bullet}$	0.12^{**}	0.17^{**}	$0.22^{\bullet}$	$0.20^{\bullet}$	$0.32^{\bullet}$
	[0.09]	[0.12]	[0.06]	[0.06]	[0.08]	[0.12]	[0.11]	[0.13]	[0.07]	[0.10]	[0.07]	[0.07]	[0.12]
ME $aid_A > 0$	$1.03^{\bullet}$	$1.03^{\bullet}$	$0.93^{\bullet}$	$0.87^{\bullet}$	$1.12^{\bullet}$	$1.10^{\bullet}$	$1.06^{\bullet}$	$0.97^{\bullet}$	$1.05^{\bullet}$	$1.16^{\bullet}$	$1.13^{\bullet}$	$1.05^{\bullet}$	$1.03^{\bullet}$
	[0.19]	[0.22]	[0.19]	[0.23]	[0.21]	[0.22]	[0.22]	[0.22]	[0.23]	[0.20]	[0.22]	[0.21]	[0.24]

Notes. Robust standard errors in brackets and p-values in parentheses. $^{\bullet}$ p<0.01, ** p<0.05, * p<0.1. The dependent variable is FDI per capita. All regressions include a constant and time dummies. External instruments for the aid variables are interactions with log(population), GDP per capita and a FRZ dummy.

Table 6: FDI and Foreign Aid — Economic and Financial Risks (extended model)

	Economic risk					**Financial risk**				
Risk measure:	GDP per capita (1)	GDP growth (2)	Inflation rate (3)	Budget balance (4)	Curr. Acc. balance (5)	Foreign debt to GDP (6)	Foreign debt service to exp. (7)	Curr. Acc. to exports (8)	Reserves to imp. months (9)	Exch. Rate stability (10)
aid_K	-0.92^{***}	-0.87^{***}	-0.92^{***}	-1.06^{***}	-0.80^{***}	-0.89^{***}	-0.96^{***}	-0.89^{***}	-0.91^{***}	-0.95^{***}
	[0.2]	[0.2]	[0.2]	[0.2]	[0.2]	[0.2]	[0.2]	[0.2]	[0.2]	[0.2]
aid_A	1.10^{***}	1.00^{***}	1.17^{***}	1.18^{***}	1.07^{***}	1.37^{***}	1.24^{***}	1.11^{***}	1.02^{***}	1.18^{***}
	[0.2]	[0.2]	[0.2]	[0.2]	[0.2]	[0.2]	[0.3]	[0.2]	[0.3]	[0.2]
aid_A, squared	-0.0014^{***}	-0.0013^{***}	-0.0014^{***}	-0.0014^{***}	-0.0015^{***}	-0.0014^{***}	-0.0014^{***}	-0.0014^{***}	-0.0013^{***}	-0.0014^{***}
	[0.0002]	[0.0002]	[0.0002]	[0.0001]	[0.0002]	[0.0002]	[0.0002]	[0.0002]	[0.0002]	[0.0002]
aid_A×Risk	0.021	0.016^{**}	-0.34^{**}	-1.81^{***}	-0.029^{**}	-0.32^{**}	-0.0026	-0.42	0.035	-0.52^{**}
	[0.03]	[0.008]	[0.2]	[0.6]	[0.01]	[0.1]	[0.005]	[0.5]	[0.04]	[0.2]
Risk	11.8^{***}	0.74	1.05	32.1	0.75	13.9^{**}	0.2	13.4	-5.34^{***}	0.92
	[4.3]	[0.7]	[5.9]	[76]	[0.5]	[6.8]	[0.3]	[16]	[1.2]	[5.9]
fdi_{t-1}	0.39^{***}	0.39^{***}	0.42^{***}	0.27^{***}	0.42^{***}	0.39^{***}	0.46^{***}	0.40^{***}	0.38^{***}	0.42^{***}
	[0.1]	[0.1]	[0.1]	[0.06]	[0.1]	[0.1]	[0.1]	[0.1]	[0.1]	[0.1]
Savings, sy	-17.2	-19.3	-19.4	-18.8	-21.1	-11.6	-16.9	-18.8	-6.7	-21.5
	[18]	[18]	[18]	[18]	[15]	[19]	[17]	[17]	[14]	[17]
Pop. gr., n	-4.19	-4.90^{*}	-3.92	-5.74^{**}	-4.32	-7.85^{**}	-5.51^{*}	-4.18	-5.07^{*}	-4.13
	[2.8]	[2.6]	[2.5]	[2.6]	[2.7]	[3.2]	[2.8]	[2.6]	[2.8]	[2.5]
GDP per capita		13.9^{***}	12.8^{***}	11.2^{**}	13.0^{***}	11.9^{**}	12.5^{***}	12.8^{***}	10.8^{***}	13.3^{***}
		[4.1]	[4.3]	[4.4]	[3.6]	[4.8]	[3.8]	[3.9]	[3.2]	[4.2]
Prim. schooling	0.036	0.0092	0.063	0.17	0.016	-0.052	-0.11	-0.026	0.13	0.099
	[0.2]	[0.2]	[0.1]	[0.2]	[0.2]	[0.2]	[0.2]	[0.2]	[0.2]	[0.1]
Observations	233	233	229	203	223	229	219	223	218	233
N. Countries	72	72	71	65	72	70	70	72	70	72
Sargan test	(1.00)	(1.00)	(1.00)	(0.00)	(1.00)	(1.00)	(1.00)	(1.00)	(1.00)	(1.00)
AR(1)	(0.49)	(0.66)	(0.36)	(0.95)	(0.28)	(0.62)	(0.39)	(0.48)	(0.66)	(0.35)
Hypothesis tests on marginal effects evaluated at the median:										
ME of $aid_K = -1$	0.08	0.13	0.08	-0.06	0.20	0.11	0.04	0.11	0.09	0.06
	[0.20]	[0.18]	[0.21]	[0.16]	[0.19]	[0.18]	[0.22]	[0.21]	[0.20]	[0.21]
ME of $aid > 0$	0.14	0.13^{***}	0.16^{***}	0.11^{**}	0.29^{***}	0.24^{***}	0.17^{***}	0.21^{***}	0.16^{***}	0.13^{**}
	[0.11]	[0.05]	[0.07]	[0.06]	[0.08]	[0.08]	[0.06]	[0.07]	[0.06]	[0.07]
ME of $aid_A > 0$	1.07^{***}	1.00^{***}	1.08^{***}	1.17^{***}	1.10^{***}	1.12^{***}	1.13^{***}	1.11^{***}	1.08^{***}	1.07^{***}
	[0.19]	[0.21]	[0.20]	[0.16]	[0.18]	[0.20]	[0.22]	[0.20]	[0.20]	[0.20]

Notes. Robust standard errors in brackets and p-values in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is FDI per capita. All regressions include a constant and time dummies. External instruments for the aid variables are interactions with log(population), GDP per capita and a FRZ dummy.

Table 7: Partial Correlations — Main Variables

	fdi	aid_K	aid_A	$aid_A^\dagger$	n	sy
fdi	1					
aid_K	−0.24	1				
aid_A	−0.16	0.79	1			
$aid_A^\dagger$	−0.15	0.78	0.99	1		
n	−0.24	0.03	−0.05	−0.02	1	
sy	0.35	0.12	0.19	0.17	−0.18	1

Table 8: Partial Correlations — Economic Risk Measures

	GDP per capita	GDP growth	Inflation rate	Budget balance	Curr. Acc. balance
GDP per capita	1				
GDP growth	−0.08	1			
Inflation rate	0.14	−0.23	1		
Budget balance	0.12	0.18	−0.20	1	
Curr. Acc. balance	0.22	0.19	−0.24	0.25	1

Table 9: Partial Correlations — Financial Risk Measures

	Foreign debt	For. debt service	Curr. Acc. to exports	Reserves to imp. months	Exch. R. stab.
Foreign debt	1				
For. debt service	0.14	1			
Curr. Acc. to exports	−0.56	−0.17	1		
Reserves to imp. months	−0.24	−0.05	0.22	1	
Exch. R. stab.	0.30	0.28	−0.26	−0.01	1

Table 10: Partial Correlations — Political Risk Measures

	ICRG index	Govt. stab.	Socio-ec. condit.	Investm. profile	Internal conflict	External conflict	Political corrup.	Military in politics	Religious tensions	Law and Order	Ethnic tensions	Democ. account.	Bureauc. quality
ICRG index	1												
Govt. stab.	0.68	1											
Socio-ec. condit.	0.36	−0.10	1										
Investm. profile	0.70	0.66	0.29	1									
Internal conflict	0.72	0.51	0.25	0.48	1								
External conflict	0.53	0.35	0.03	0.32	0.46	1							
Political corrup.	0.30	0.10	0.19	0.14	0.29	0.05	1						
Military in politics	0.55	0.31	0.19	0.40	0.52	0.26	0.42	1					
Religious tensions	0.34	0.17	0.04	0.21	0.39	0.32	0.29	0.30	1				
Law and Order	0.63	0.48	0.19	0.40	0.65	0.25	0.35	0.42	0.23	1			
Ethnic tensions	0.47	0.28	0.06	0.23	0.57	0.27	0.33	0.37	0.41	0.42	1		
Democ. account.	0.33	0.18	−0.05	0.25	0.21	0.28	0.35	0.44	0.14	0.16	0.20	1	
Bureauc. quality	0.47	0.23	0.32	0.30	0.29	0.11	0.40	0.47	0.04	0.34	0.19	0.35	1

Table 11: Summary Statistics

	Obs	Median	Mean	Std. dev.	Min.	Max
Main variables:						
fdi	289	9.8	27.2	64.1	−384.9	547.0
aid_K	289	6.8	15.9	41.9	−18.7	442.1
aid_A	289	21.6	40.1	79.6	−12.2	914.4
$aid_A^\dagger$	287	32.5	50.3	82.2	−7.0	926.0
n	289	2.3	2.2	1.0	−5.1	7.0
sy	289	0.1	0.3	0.5	−0.4	3.2
Political risk measures:						
ICRG index	233	60.3	60.1	10.3	27.6	80.6
Govt. stab.	232	8.0	7.6	2.2	2.3	12.0
Socio-ec. condit.	232	5.0	4.9	1.5	1	9
Investm. profile	232	6.1	6.3	1.8	1.2	11
Internal conflict	232	8.2	7.8	2.4	0.4	12.0
External conflict	232	9.8	9.4	2.0	2.3	12.0
Political corrup.	232	3.0	2.8	0.9	0	5
Military in politics	232	3.0	3.1	1.5	0	6
Religious tensions	232	5.0	4.3	1.4	0	6
Law and Order	232	3.0	3.2	1.1	1	6
Ethnic tensions	232	4.0	3.9	1.4	0	6
Democ. account.	232	3.3	3.3	1.2	0	6
Bureauc. quality	232	2.0	1.7	0.9	0	3.5
Economic risk measures:						
GDP per capita	289	1.1	1.5	1.7	0.1	9.1
GDP growth	289	3.7	3.7	3.1	−11.5	15.7
Inflation rate	280	0.1	0.2	0.3	0.0	2.8
Budget balance	242	0.0	0.0	0.0	−0.4	0.2
Curr. Acc. balance	274	−3.1	−3.2	5.9	−31.2	20.1
Financial risk measures:						
Foreign debt	285	0.6	0.7	0.6	0.1	7.0
For. debt service	270	18.8	19.7	13.5	1.3	84.5
Curr. Acc. to exports	274	−0.1	−0.2	0.3	−1.6	0.4
Reserves to imp. months	268	3.3	3.8	3.1	0.1	26.0
Exch. R. stab.	289	0.1	0.2	0.4	−1.7	2.8

Table 12: Sample

		75-79	80-84	85-89	90-94	95-99	00-01			75-79	80-84	85-89	90-94	95-99	00-01
ALB	Albania						×	MNG	Mongolia					×	×
ARG	Argentina		×	×	×	×	×	MOZ	Mozambique				×	×	×
ARM	Armenia						×	MRT	Mauritania				×	×	×
BDI	Burundi				×	×	×	MUS	Mauritius				×	×	×
BEN	Benin		×	×	×	×	×	MWI	Malawi						×
BFA	Burkina Faso	×	×	×	×	×		MYS	Malaysia			×	×	×	×
BGD	Bangladesh					×	×	NAM	Namibia					×	×
BGR	Bulgaria						×	NER	Niger	×	×	×	×	×	×
BOL	Bolivia			×	×	×	×	NGA	Nigeria		×			×	×
BRA	Brazil	×	×	×	×	×	×	NIC	Nicaragua			×	×	×	×
BWA	Botswana		×	×	×	×	×	NPL	Nepal	×	×	×	×	×	×
CAF	Central African Rep.		×	×	×	×	×	OMN	Oman					×	×
CHL	Chile		×	×	×	×	×	PAK	Pakistan	×	×	×	×	×	
CHN	China			×	×	×	×	PAN	Panama			×	×	×	×
CIV	Côte d'Ivoire				×	×		PER	Peru			×	×	×	×
CMR	Cameroon	×	×	×	×	×	×	PHL	Philippines		×	×	×	×	×
COG	Congo, Rep.				×	×	×	PRY	Paraguay		×	×	×	×	×
COL	Colombia	×	×	×	×	×	×	ROM	Romania					×	
CRI	Costa Rica		×	×	×	×	×	RUS	Russia					×	
DOM	Dominican Republic					×	×	RWA	Rwanda		×	×	×	×	×
DZA	Algeria	×	×	×	×	×	×	SAU	Saudi Arabia					×	×
ECU	Ecuador			×	×	×		SDN	Sudan	×	×	×		×	×
EGY	Egypt		×	×	×	×		SEN	Senegal	×	×	×	×	×	×
ETH	Ethiopia		×	×	×	×	×	SLV	El Salvador					×	×
GHA	Ghana					×	×	SYR	Syria				×	×	×
GTM	Guatemala			×	×	×	×	TCD	Chad		×	×	×	×	×
HND	Honduras			×	×	×	×	TGO	Togo				×	×	×
HRV	Croatia						×	THA	Thailand		×	×	×	×	×
HTI	Haiti			×	×	×	×	TJK	Tajikistan					×	
IDN	Indonesia			×	×	×	×	TTO	Trinidad & Tobago						×
IND	India	×	×	×	×	×	×	TUN	Tunisia	×	×	×	×	×	×
IRN	Iran					×	×	TUR	Turkey			×	×	×	×
JAM	Jamaica					×	×	TZA	Tanzania				×	×	×
JOR	Jordan	×	×	×	×	×	×	UGA	Uganda					×	×
KAZ	Kazakstan					×	×	UKR	Ukraine						×
KEN	Kenya		×	×	×	×	×	URY	Uruguay						×
KHM	Cambodia						×	UZB	Uzbekistan					×	×
LAO	Laos					×	×	VEN	Venezuela				×	×	×
LKA	Sri Lanka				×	×	×	VNM	Viet Nam			×	×	×	
MAR	Morocco				×	×	×	YEM	Yemen				×	×	×
MEX	Mexico		×	×	×	×	×	ZAF	South Africa					×	×
MLI	Mali				×	×	×	ZWE	Zimbabwe			×	×	×	×

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